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Figs. 162, 163

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· CONTENTS ·

		PAGE.
EDITORIALS		1
THE AMERICAN SCHOOLHOUSE. III.	*Edmund M. Wheelwright*	3
ARCHITECTURAL TERRA-COTTA—COOPERATION BETWEEN ARCHITECT, ENGINEER, AND CLAYWORKER	*Thomas Cusack*	7
REPORT OF THE COMMITTEE ON ARCHITECTURE AND GROUNDS OF THE TENNESSEE CENTENNIAL EXPOSITION		9
THE DISINTEGRATION OF CLAY BY FROST		11
FIRE-PROOFING.		
Proper Construction as applied to Fire-proofing Materials		13
The London Fire		13
MORTAR AND CONCRETE		
Characteristics of Various Brands of American Natural Cement	*Clifford Richardson*	14
MASONS' DEPARTMENT		
Brick Veneer Construction	*Fred T. Hodgson*	16
Cracks in Plastering		16
RECENT BRICK AND TERRA-COTTA WORK IN AMERICAN CITIES AND		
MANUFACTURERS' DEPARTMENT		17

For Index to Advertisements see page 24

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INDEX, VOLUME SEVEN

JANUARY—DECEMBER

1898

PLATE ILLUSTRATIONS.—CLASSIFIED.

	Location.	Architect.	Journal No.	Plate No.
ASYLUMS HOSPITALS	Boston, Mass.	Wheelwright & Haven	9	68, 69, 70, 71, 72
	Chicago, Ill.	Shepley, Rutan & Coolidge	2	9, 10
	New York City	Israels & Harder	10	78, 79, 80
	Washington, D. C.	Edward W. Donn, Jr	8	64
	Wernersville, Pa.	Rankin & Kellogg	8	57, 58, 59, 60
BUSINESS BUILDINGS,—OFFICE AND STORE	Pittsburgh, Pa.	Alden & Harlow	1	7
	St. Paul, Minn.	Cass Gilbert	6	45, 46, 47, 48
CHURCHES	Fall River, Mass.	Cram, Wentworth & Ferguson	12	89, 90, 91, 92
	Hartford, Conn.	Ernest Flagg, George M. Bartlett } Associated	3	21, 22, 23, 24
	Philadelphia, Pa.	Baily & Truscott	7	56
	Sing Sing, N. Y.	Renwick, Aspinwall & Owen	5	39, 40
CLUB HOUSES	Princeton, N. J.	Cope & Stewardson	1	3, 4
	New York City	J. A. Schweinfurth	5	33
COLLEGE AND SOCIETY BUILDINGS	Boston, Mass.	Wheelwright & Haven	2	14, 15, 16
	Cambridge, Mass.	A. W. Longfellow, Jr	6	41, 42, 43
	New York City	N. Le Brun & Sons	11	81, 82, 83, 84
	Philadelphia, Pa.	Frank Miles Day & Brother	6	44
	Philadelphia, Pa.	Rankin & Kellogg	9	65, 66
	Philadelphia, Pa.	James H. Windrim	10	75, 76
ENGINE HOUSES	New York City	Edward Pierce Casey	11	85, 86
GYMNASIUMS	Glen Mills, Pa.	Cope & Stewardson	7	53, 54, 55
HOSPITALS	See Asylums.			
HOUSES,—RESIDENCES	Boston, Mass.	R. Clipston Sturgis	9	67
	Chicago, Ill.	Shepley, Rutan & Coolidge	2	11, 12, 13
	Lawrence, L. I., N. Y.	T. Henry Randall	4	31, 32
	Lenox, Mass.	Carrere & Hastings	3	17, 18, 19, 20
	Llewellyn Park, N. J.	Algernon S. Bell	11	88
	New York City	Carrere & Hastings	12	93, 94
	New York City	McKim, Mead & White	5	34
	New York City	McKim, Mead & White	4	27, 28, 29, 30
	New York City	Little & Brown	4	25, 26
	New York City	Howard & Cauldwell	10	77
	Pittsburgh, Pa.	Alden & Harlow	1	8
	Pittsburgh, Pa.	Peabody & Stearns	12	95, 96
	Princeton, N. J.	Cope & Stewardson	1	1, 2
	St. Louis, Mo.	Renwick, Aspinwall & Owen	5	35, 36, 37
LIBRARIES	Annapolis, Md.	T. Henry Randall	11	87
	Erie, Pa.	Alden & Harlow	1	5, 6
MUSEUM BUILDINGS	New York City	R. W. Gibson	8	61, 62
POST OFFICES	Pottsville, Pa.	James Knox Taylor	8	63
TOWN HALLS	East Orange, N. J.	Boring & Tilton	7	49, 50, 51, 52

MEASURED DRAWINGS. FOREIGN — DOMESTIC.

Description.	Drawn By.	Journal No.	Plate No.
Upper Portion of Tower of Monastery Church at Chiaravalle..	C. H. Alden, Jr	5	38
Harwood House, Annapolis, Md.	C. H. Alden, Jr	10	73, 74

MISCELLANEOUS ILLUSTRATIONS IN LETTER-PRESS.

This list does not include illustrations made in connection with articles, nor those of terra-cotta details.

Title and Location.	Architect.	Page.
BACHELOR Apartment, New York City	Franklin D. Pagan	46
Bayard Building, New York City	Louis H. Sullivan, Lyndon P. Smith } Associated	127
Board of Education Building, St. Louis, Mo	Isaac S. Taylor	21
Boston Athletic Club, Boston, Mass	Sturgis & Cabot	19
Brick Cornices, Siena, Italy	James P. Jamieson, Del	164
Buffalo General Hospital, Buffalo, N. Y	George Cary	242
Burt's Theater, Toledo, Ohio	George S. Mills	220

Title and Location.	Architect.	Page.
Business Block, Philadelphia, Pa	Hales & Ballinger	88
Business Block, Philadelphia, Pa	Cope & Stewardson	240
CARNEGIE Library, Lawrenceville Branch, Pittsburgh, Pa	Alden & Harlow	130
Catlin Block, Hartford, Conn	W. C. Brocklesby	151
Chemical Building, St. Louis, Mo		194
Church, Southport, Conn	Hobart A. Walker	265
Cloister, St. Christopher's Mission House, New York City	Barney & Chapman	151
Converse Building, Boston, Mass	Winslow & Wetherell	150
DAIRY Company's Building, St. Louis, Mo	W. Albert Swasey	21
HAMILTON Club House, Paterson, N. J	Charles Edwards	2
Harwood House, Annapolis, Md	H. F. Briscoe, Del	12
House, Boston, Mass	H. H. Richardson	87
House, Boston, Mass	McKim, Mead & White	243
House, Brookline, Mass	Winslow & Wetherell	66
House, Brookline, Mass	Shepley, Rutan & Coolidge	265
House, Buffalo, N. Y	George Cary	221
House, Buffalo, N. Y	McKim, Mead & White	266
House, Des Moines, Iowa	Frederick Weitz	222
House, New York City	Frank Miles Day & Brother	41
House, New York City	McKim, Mead & White	65
House, Philadelphia, Pa	Cope & Stewardson	27
House, Pittsburgh, Pa	Peabody & Stearns	262
House, St. Louis, Mo	Barnett, Haynes & Barnett	20
House, St. Louis, Mo	Barnett, Haynes & Barnett	44
JEFFERSON Medical College, Philadelphia, Pa	James H. Windrim	219
LIBRARY, Erie, Pa	Alden & Harlow	241
MAIN Entrance, City Hall, Paterson, N. J.	Carrere & Hastings	108
Mantel, House, Philadelphia, Pa	Peabody & Stearns	17
Manufacturing Building, Burlington, Vt	W. R. B. Willcox	174
Mellon Block, Pittsburgh, Pa	Alden & Harlow	175
Museum Building, Botanical Garden, New York City	R. W. Gibson	171
OCTAGON House, Washington, D. C		113
Office Building, London, England	R. Norman Shaw	93
PARK Row Syndicate Building, New York City	R. H. Robertson	148
Park Theatre, Niagara Falls, N. Y	Orchard & Joralemon	221
Planters' Hotel, St. Louis, Mo	Isaac S. Taylor	19
Plan, House at Pittsburgh, Pa	Alden & Harlow	18
Plan, House at New York City	McKim, Mead & White	107
Plan, City Hospital, Boston, Mass	Wheelwright & Haven	195
Power House and Car Barn, Chicago, Ill	Reed & Stem	22
ROWE Departmental Store, Pittsburgh, Pa	Alden & Harlow	197
SCHOOL Building for Deaf and Dumb, Columbus, Ohio	Richards & McCarty	240
Stable, New York City	Thayer & Wallace	266
St. Christopher's Mission House, New York City	Barney & Chapman	42
St. James Hall, Philadelphia, Pa	Rankin & Kellogg	193
St. Mark's School, Southboro, Mass	Henry Forbes Bigelow	171
State Asylum for Insane, Wernersville, Pa	Rankin & Kellogg	172
Store and Office Front, Toronto, Canada	Arthur E. Wells	197
Synagogue, Toronto, Canada	J. W. Siddall	44
THE Fair Building, Chicago, Ill	Jenney & Mundie	149
Town Hall, East Orange, N. J	Boring & Tilton	149
UNITED States Appraisers' Warehouse, New York City	William Martin Aiken	173
WATER Tower, Chapinville, Conn	Stone, Carpenter & Willson	150

SERIALS.

AMERICAN SCHOOLHOUSE, THE.

BY EDMUND M. WHEELWRIGHT.

(This series was begun in the November number, 1897.)

		Page.
Paper III.	Construction and Costs	3
	Illustrations.	
	Agassiz Grammar, Boston, Mass.	
	Brooks Grammar, Medford, Mass.	
	Pierce Grammar, West Newton, Mass.	
Paper IV.	Construction and Costs	29
	Illustrations.	
	Hopedale Grammar, Hopedale, Mass.	
	Longfellow Grammar, Boston, Mass.	
	Margaret Fuller Grammar, Boston, Mass.	
	Sewall Grammar, Brookline, Mass.	
Paper V.	Construction and Costs	51
	Illustrations.	
	Plans by William Atkinson.	
	Eustis Street Primary, Boston, Mass.	
	Wyman Street Primary, Boston, Mass.	
	North Brighton Grammar, Boston, Mass.	
Paper VI.	Construction and Costs	73
	Illustrations.	
	Gilbert Stuart Grammar, Boston, Mass.	
	Paul Revere Grammar, Boston, Mass.	
	Cambridge High, Cambridge, Mass.	
	Williams Primary, Boston, Mass.	
Paper VII.	Planning of High Schools	94
	Illustrations.	
	English High, Boston, Mass.	
	Cambridge High, Cambridge, Mass.	
Paper VIII.	Planning of High Schools	114
	Illustrations.	
	High School, New Britain, Conn.	
	High School, Providence, R. I.	
Paper IX.	Manual Training	135
	Illustrations.	
	Manual Training School, St. Louis, Mo.	
	Manual Training School, Toledo, Ohio.	
	Manual Training School, Cambridge, Mass.	

Page.

Paper X. Mechanics Arts High, Boston, Mass.....155
Illustrations.
Mechanics Arts High, Boston, Mass.

Paper XI. Plumbing, Heating, and Ventilation.....179
Illustrations.
Proposed High School, Marlboro, Mass.

Paper XII. Specifications.....203
Illustrations.
De Lancey School, Philadelphia, Pa.
Brown School, Hartford, Conn.

Paper XIII. Specifications.....225
Illustrations.
Pierce Grammar, Brookline, Mass.
High School, South Boston, Mass.
Gibson Grammar, Boston, Mass.

ARCHITECTURE OF APARTMENT BUILDINGS.

BY IRVING K. POND.

Paper I. 116
Paper II. 139
Paper III. 249

ARCHITECTURAL TERRA-COTTA.

BY THOMAS CUSACK.

Paper I. Cooperation between Architect, Engineer, and Clay-worker.....7
Paper II. Sill Course, Panel and Balcony Construction.....55
Paper III. Balcony Construction.....98
Paper IV. Balcony Construction.....142
Paper V. Balcony and Parapet Balustrading.....185
Paper VI. Terra-Cotta Balustrading.....230

BRICK AND MARBLE IN THE MIDDLE AGES (Reprint).

BY G. EDMUND STREET.

The reprint of this work was begun in THE BRICKBUILDER for January, 1894, and has been continued in the following numbers:—

Volume III. Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.
Volume IV. Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
Volume V. No. 2.
Volume VII. No. 2.....34
No. 5.....100
No. 8.....160
No. 10.....210

ON THE SALINE EFFLORESCENCE OF BRICKS.

BY OSCAR GERLACH.

Paper I. 59
Paper II. 79
Paper III. 102
Paper IV. 121

SUBURBAN RESIDENCE BUILT OF BRICK: COST, $10,000.

Paper I. .....By Charles A. Rich.....157
Paper II. .....By Edward B. Green.....182
Paper III. .....By Alfred B. Harlow.....207
Paper IV. .....By Walter Cope.....247

MISCELLANEOUS ARTICLES.

A Bright, Clean, and Brilliant City.....129
Bonding of Brickwork, The.....259
Ceramic Mosaic *vs.* Marble Pavement.....241
Disintegration of Clay by Frost, The.....11
Efflorescence of Brickwork.....237
Grueby Faience, The.....162
Important Problems in Construction.....252
League Exhibit, The.....27
New Form of Enamel Tiling.....45
Notes on Terra-Cotta for Exterior Polychrome Decoration.....119
Preserving Records of Foundations.....236
Report of the Committee on Architecture and Grounds of the Tennessee Centennial Exposition.....9
Rulings on Questions Concerning Real Estate Under the War Revenue Law.....138
Strength of Brick Masonry.....58, 77
T Square Club Exhibit, The.....28
Test of the Crushing Strength of Brick Piers.....28
Tensile Tests of Cement.....165, 187
Use of Terra-Cotta for Interiors.....68

LEADING EDITORIALS.

Page.

A Question of Ethics.....223
Boston Subway — A Lost Opportunity.....133
Cleaning of Outside Windows in Tall Buildings.....92
Colored Brick.....245
Color in Architecture.....153
Enamels on Burnt Clay.....49
Ephemeral Construction.....71
Extension of Boston Fire Limits.....111
Hard Times and High Ideals.....201
Responsibility of the Architect.....177
Retrospective.....1
Skeleton Construction.....91
Small Opportunities.....25

SPECIAL DEPARTMENTS.

FIRE-PROOFING.
A Seventeen-Story Building Tested by Fire.....255
An Example of Fire-proof Church Architecture.....232
Cement *vs.* Terra-Cotta Construction.....13
Consensus of Opinion Among Leading Architects of Chicago on the Use of Burned Clay for Fire-proof Buildings.....167, 189
Failure and Efficiency in Fire-proof Construction.....38
Fire-proofing with Burned Clay.....144
How to Build Fire-proof.....61, 80
Livingston Building Fire, The.....37
London Fire, The.....13
Recent Improvements in the Manufacture of Fire-proof Building Materials from Clay.....214
Report on a Recent Fire-proofing Test.....37
Report of Fire Losses for 1897.....168
Report on Home Life Building Fire, New York, Dec. 4, 1898.....256
Some Notes upon the Struggle for Survival between Burnt Clay Fire-proofing and its Newly Arisen Rivals.....103, 123

MORTARS AND CONCRETE.
Cement Industry in United States.....125
Characteristics of Various Brands of American Natural Cement.....14
Hydraulic Cements.....124, 147
Physical Tests of Portland Cement.....237
Proper Manipulation of Tests of Cement.....38
Quality of Mortar.....146
Strength of Concrete.....105
Tests of Quick-Setting Cement.....85

MASONS' DEPARTMENT.
Brick Veneer Construction.....16
Certain Rights of the Contractor.....105
Concerning the Rights of Contractors and Authority of Architects.....40
Competition in Bidding.....64
Contractor and Referee, The.....85
Cracks in Plastering.....16
Effect of Mistake in Statement of Amount.....160
Electric Condition of Modern Buildings.....192
Enameled Brick.....126
Estimating Brickwork.....169, 191
Experiment in Municipal Work, An.....64
Exterior Scaffolding.....192
Laying Brick in Cold Weather.....126
Limestone in Concrete Injurious to Iron.....105
Liquidated Damage for Breach of Contract.....64
Material Man.....146
Mixing Concrete by Gravitation.....192
Regulating Competition Methods of Estimating.....126
Some Mistakes of Contractors as Viewed by an Architect.....216, 238
Stable Subsoil for Foundations.....147
Surety Liable on Building Contract.....147
Walling Up.....85

RECENT BRICK AND TERRA-COTTA WORK IN AMERICAN CITIES
Buffalo Letters.....67
Chicago Letters.....18, 44, 86, 106, 129, 148, 171, 218, 239
Cincinnati Letters.....43
Columbus Letters.....241
New York Letters.....17, 41, 65, 86, 106, 127, 148, 170, 193, 217, 239, 261
Memphis Letters.....80
Minneapolis Letters.....172, 262
Philadelphia Letters.....42, 66, 87, 170, 261
Pittsburgh Letters.....66, 107, 149, 193, 240
St. Louis Letters.....43, 88, 128, 172, 218, 263
News Items.....20, 45, 69, 89, 108, 130, 150, 174, 196, 220, 242, 263

VOLVME VII JAN. 1898 No. 1

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AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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RETROSPECTIVE.

THE first of January has come to be associated with the turning over of new leaves and a certain amount of retrospection preparatory to a plunge into the hopes and fears which are supposed to lie before us; and though moralizing can hardly be called a branch of the burnt-clay arts or industries, by a somewhat circuitous association of ideas we are led to some reflection. This is a rapid age. Rapid transit is in the air, and not only in our streets and in our commercial structures, but in our professional life as well has the necessity for haste been made to seem to be paramount. Surely no one material has contributed more to the exigencies of haste, at least as regards the external finish of our buildings, than that which is the product of the burnt-clay industries, and the feeling of perpetual rush which is such a factor of our modern professional and mechanical life is quite as strongly felt in the particular lines of industry and industrial art which this journal represents as in any other department of human production. The old story of the artist painter who claimed that the secret of his success was that he mixed brains with his pigments is applicable to every industry which depends for its final character upon intelligence and direct, concerted effort. Now, the application of brains to the arts and sciences means time, and a lot of it. It has come to be a trite saying that we live too fast, but the necessity for deliberate thought, for making haste slowly, though ever present with us, can hardly be emphasized too strongly. There are some natures whose genius is most available at high pressure, and who need the excessive voltage to develop their illuminating power. There are other fortunate mortals who can handle fifty different enterprises at once, make a success of each, and keep on a keen jump for years, finally going up with a shout, closing the chapter in full fighting trim. But for those of us who are just plain mortals, time is a very important and indispensable adjunct to the production of any really excellent work, though it is one which is unfortunately very often neglected. We permit ourselves to be rushed, we know full well that we do not give the cautious, deliberate thought and study to our work which we know it deserves, and we have no one but ourselves to thank for the inchoate, ill-digested aspect of so much of our current architecture. We know how to do things right, but we are too prone not to take time to do it.

The good Book tells us that no man by taking thought can add to his stature. Nevertheless we know that by taking thought we can add continually and indefinitely to our mental and artistic stature. We need at times to sit down quietly by ourselves and forget that there is a client who is in a terrible hurry to have a building done on the first of the month, or a contractor who is impatiently calling for details, and to collect our thoughts, striving to formulate our ideas and turn our problems over and over in our head until we can feel the familiarity with them which is very likely to lead to the best kind of a solution. Annie Besant is quoted as saying that if she has a very serious problem to consider, she gathers all the facts before her and then goes to sleep over them. A little more of this same procedure would give us better buildings, more systematic planning, and more artistic treatment of details; would go further, in fact, to give us what is so often sighed for and which we are but slowly approximating, — a national, distinctive style of work. Our busy men do not give themselves time for thought. We remember a short time since having a very interesting interview with one of our leading architects, who confessed to being so tired out and rushed with work that his digestion had been impaired, he was troubled with insomnia, and he felt thoroughly used up. But the stirring necessities of his practise, as he viewed them, kept him at the mill, when by rights he ought to have been out in the woods, or fishing, or doing something entirely different from his daily work, to give his tired brain a chance; and when we recall the really excellent work which he was able to turn out year after year under these excessive conditions, we cannot but think how much easier the same could have been accomplished, to say nothing of the possibility of better results, had he simply refused to be hurried, and demanded time to think and to study.

PROF. F. W. CHANDLER, who is at the head of the Architectural Department of the Massachusetts Institute of Technology, has recently been appointed official architectural adviser to the mayor of Boston. An office of this kind is not entirely new in municipal matters, but it has not been created and filled so often that there has yet been any definite precedent. Consequently, there is an added pleasure in noting the appointment. It is pleasant to think that the city of Boston has a mayor who appreciates the conditions sufficiently to admit that he does not know everything about architecture. The average city official is so seldom troubled with this kind of modesty that such an appointment is not what one would ordinarily expect, but the mayor has shown himself capable of rising above the level of the politician, and his selection is one that will receive the approval of all who are interested in good munic-

ipal architecture, properly selected and properly supervised. Professor Chandler is an eminent architect, abundantly qualified to give the best sort of advice, while at the same time his connection with the Institute removes him from the suspicion of interested advice and takes him out of active competition with his brother architects.

WE had occasion some time since to observe the construction in a building which had been in place for some thirty years, and which presented several points of interest. The floors were composed of wrought-iron beams connected by brick arches, the brickwork being laid in Rosendale cement mortar. The building was an average one, subjected to the ordinary conditions, not as good as the best and yet not especially exposed at any point. The beams rested upon brick walls laid up in cement. A careful inspection failed to show any signs of rust about any of the beams. Furthermore, the paint, which appeared to be red lead, was intact over nearly the entire surface of the iron. It is frequently asserted that cement acts as a preservative for iron or steel in construction. Lime certainly attacks the iron to a limited extent, but sufficiently so as to effect a marked change in the course of years; and plaster of Paris likewise attacks iron slightly, though we imagine the cause in this case is due rather to the extreme avidity with which plaster of Paris will absorb moisture from the air and then give it out to the iron; but whether the cement really protects the iron or not, there is every reason to believe that it protects the paint, and the paint in its turn protects the iron. Consequently if the iron beams are carefully painted before being enclosed, and the brick or terra-cotta used therewith is thoroughly bedded in cement so the cement protects the paint, there is pretty good evidence that we can safely depend upon freedom from corrosion for an indefinite period.

PERSONAL AND CLUB NEWS.

C. A. BREHMER, architect, has opened an office at 215 West Jefferson Street, South Bend, Ind. Catalogues and samples desired.

MORGAN M. RENNER, architect, has taken offices in the Hartford Building, Broadway and 17th Street, New York City. Catalogues and samples desired.

EDWARD J. DOUGHERTY and F. Dickinson Shaw have formed a copartnership under the firm name of Dougherty & Shaw, for the practise of architecture, with offices at 317 Market Street, Camden, N. J. Catalogues and samples desired.

GEORGE OAKLEY TOTTEN, JR., chief designer in the office of the supervising architect at Washington, during Mr. Aiken's administration, has resigned that position, and formed a copartnership with Laussat Richter Rogers, under the firm name of Totten & Rogers, for the practise of architecture. The new firm has taken offices at 931 Chestnut Street, Philadelphia.

THE president and officers of the T Square Club, of Philadelphia, held a reception on the evening of January 24, at the Pennsylvania Academy of the Fine Arts.

THE Chicago Architectural Club is having its usual lively and interesting midwinter season. Among the recent events were the Annual Christmas Celebration, on the evening of December 29, the first exhibition of the Projét Drawings, January 10, and the "Club Souvenir Night," December 20. Refreshments were served at each of these gatherings, a group of members acting as hosts for each occasion.

THE Annual Meeting of the New Jersey Society of Architects was held Friday, January 7, at Board of Trade Rooms, Newark, N. J., President Albert Beyer presided; Mr. James H. Lindsley, as chairman of committee on society insignia, which was open to competition among the members, reported that the committee had selected a design which was finally adopted by the society. The code of ethics and professional practise, as recommended by the board of governors, was adopted as a whole and referred back to the committee to be incorporated in the new draft of the constitution and by-laws.

The election of officers and members to the board of governors resulted as follows: President, Albert Beyer; first vice-president, Paul G. Botticher; second vice-president, James H. Lindsley; secretary and treasurer, George W. von Arx. Board of governors, vacancies to board, three-year term, Herman H. Kreitler and Rudolph W. Sailer.

After adjournment the members were invited to partake of a collation provided by the newly elected officers.

ILLUSTRATED ADVERTISEMENTS.

THE New York Architectural Terra-cotta Company send for illustration a print of the Hamilton Club, Paterson, N. J., designed by and executed under the superintendence of Mr. Charles Edwards, of that city.

Number seven of the series of brick and terra-cotta fireplace mantels especially designed for Fiske, Homes & Co., is shown in



HAMILTON CLUB HOUSE, PATERSON, N. J.
Charles Edwards, Architect.

their advertisement on page vii, J. A. Schweinfurth being the designer.

A tympanum panel executed in terra-cotta for the public school building at Port Richmond, Staten Island, I. W. Moulton, architect, is shown in the advertisement of the New Jersey Terra-cotta Company, on page viii.

The Harbison & Walker Company illustrate in their advertisement, on page xiii, the Bank of McKeesport building, at McKeesport, Pa., Longfellow, Alden & Harlow, architects.

Number three of the descriptive series of the roofing tiles made by the Celadon Terra-cotta Company, Charles T. Harris, lessee, is given in the company's advertisement, page xxvii.

Examples of bond, showing blocks of the Gilbreth Seam-Face Granite laid up in two styles of bond, is illustrated in the company's advertisement, page xxxiv.

The American Schoolhouse. III.

BY EDMUND M. WHEELWRIGHT.

IN considering the costs of the Brighton and Brookline high schools I neglected to state in my last paper that the Brighton school is but a part of the building which eventually will be built, and that it was planned with reference to its ready junction to the future construction; it therefore has features which are adequate for the enlarged structure, and the cost per cubic foot is somewhat greater than it would have been had it been constructed of the size that it will be in the future.

To continue the consideration of the cost of schoolhouses, that of those of the grammar grade will now be considered, and incidentally certain different features of plans and construction will be pointed out.

The Pierce Grammar School, at West Newton, Mass., may fairly be considered as a fourteen-room building with assembly hall, or as having accommodation equivalent to sixteen schoolrooms. The building is of brick for two stories in height, and has an assembly hall in the roof. The schoolrooms have a stud of 12 ft. The wardrobes are in part separate rooms, shut off from the main corridor and with outside light, and in part are wire netting enclosures in the corridors. The brick walls of first and second stories are 16 ins. thick. The interior partitions are of wood studding, fire stopped and wire lathed. The blackboards are of slate. The schoolroom windows, except on one long side, the south, have double run of sash.

The ground area of this building is 11,536 sq. ft. The cubical area is 611,408 cu. ft. About one third of the attic is left unfinished, as it is space which cannot advantageously be utilized for schoolhouse purposes. The cost of this building, not including grading, fencing, and paving of the yard, and deducting architect's commission, was $70,102, or 11 cts. per cubic foot. Reckoning the assembly hall as two schoolrooms, the cost per schoolroom was $4,125.

The Agassiz Grammar School was built for the city of Boston before the passage of the building law of 1892, which materially increased the cost of building schoolhouses, as will be shown hereafter. This school has fourteen schoolrooms and an assembly hall in the third story. The stud of the schoolrooms is 13 ft. 6 ins. and in third story 16 ft., the assembly having a stud of 20 ft. The blackboards are of slate. The minor partitions, where not of brick, are of terra-cotta lumber. In short, the building is constructed in the main as is recommended in my earlier papers on this subject.

The ground area of this building is 9,618 sq. ft. The cubical area is 605,934 cu. ft. The cost was $91,783 or 15 cts. per cubic foot, and $5,736 per schoolroom.

An analysis of the reason for the differences in cost of these two schools leads to interesting conclusions.

As will be seen by the perspective sketches here given, the Agassiz School is of a more elaborate design than is the Newton school, and further, the former school has exterior walls of Perth Amboy terra-cotta brick with terra-cotta trimmings, while the latter school has exterior lining of selected Eastern water-struck brick with free-stone trimmings.

Calculations of the proportionate increase expense of schoolhouses when of architectural design, and of like buildings with the exterior features of a well-constructed factory, lead me to the opinion that the excess of cost of the architectural features of the Newton school is about $3,000 above that of a wholly utilitarian structure serving the same ends, while that of the Agassiz School is about $7,000. Therefore, if the design had been stripped of all architectural features, and brought to the condition of a factory building, being otherwise unchanged in its several features, it is probable that the Newton school could have been built for about $67,000. Under the same conditions the Agassiz School could have been built for about $85,000.

This difference of cost, $18,000, can be almost wholly accounted for by the consideration of the difference in cost of foundations and brickwork, together with the difference in the construction of the interior partitions and heat and vent shafts. The external walls of the Agassiz School are 19 ft. higher and 4 ins. thicker throughout than are those of the Newton school. The interior partitions of the Newton school are of spruce studding, wire lathed. The interior partitions of the Agassiz School are for the most part 12 in. brick walls, and where not of brick are of terra-cotta lumber. All the heat and vent shafts of the Agassiz School are of brick, while two of the large shafts of the Newton school have galvanized iron vents enclosed by stud partitions.

A survey of quantities of this brickwork, the cost of the Perth Amboy brick being left out of the calculation, and the exterior surface being considered as of the same material as in the Newton school, shows that these features in the Agassiz School are worth between $15,000 and $16,000.

Further calculation of cost of certain features of the Agassiz School in excess of features performing like functions in the Newton school account for between $2,000 and $3,000 of the difference of cost of the two buildings. These features may be noted in part as follows.

In the Agassiz School the basement floor was of asphalt, that of the Newton school of concrete. The Agassiz School had double run of sash in all schoolrooms, the Newton school had single run of sash upon the south side; while the former school had seven windows at least for all corner schoolrooms, the Newton school had but six.

The Agassiz School had Keene's cement door and window finish and hospital base, the customary ash finish being used in the Newton school.

We thus see that with the evidently greater cost of the external treatment left out of calculation, the difference in cost of the two buildings can be closely accounted for, and that the excess of cost of the Agassiz School is due to features which better the construction and improve the lighting of the building. It should be said, however, that $5,000 or $6,000 of the expense might have been saved if the Agassiz School had been built in Newton instead of Boston, as the Newton building laws would have allowed, with perfect safety, a less heavily constructed building than those of Boston permitted.

If built under the Newton building laws, and if of no more elaborate external design than that of the Newton school, but otherwise unchanged in its requirements, the Agassiz School would have probably cost not more than $83,000; and taking into consideration the general greater cost of building in Boston than in the cities and towns immediately adjoining, we may fix the probable cost of a school of the construction and type here contemplated at about $80,000. Hence a fourteen-room and assembly hall grammar school, three full stories in height, constructed as was the Agassiz School, but having 16 in. instead of 20 in. external walls and general exterior design and materials no more expensive than that of the Newton school, can probably be built, where the cost of building is the same as in Newton, for $5,000 per schoolroom.

It will be interesting to compare the cost of another grammar school of nearly the same accommodations with that of the Pierce and the Agassiz Schools. To this end the plans of the Brooks School at Medford are here given.

The building has a ground area of 11,333 sq. ft. and contains 600,649 cu. ft. Upon the same basis considered above, this building cost $60,304, *i. e.*, 10¼ cts. per cubic foot and $4,285 per schoolroom. The Brooks School is a two-story brick building with assembly hall in the roof and with twelve schoolrooms. The cost per schoolroom of the Brooks School is $160 greater than that of the Newton School. It is to be expected that the larger the building of a given type the less will be the relative cost. We might suppose that this probable decrease in cost, about 4 per cent., or $165, would account for the greater relative cost per schoolroom of the Medford school, but other varying conditions of the two buildings must be considered to satisfactorily understand this difference of cost. The Brooks School is of a sufficiently simpler design than the Newton school to amount to about $50 per schoolroom of the difference.

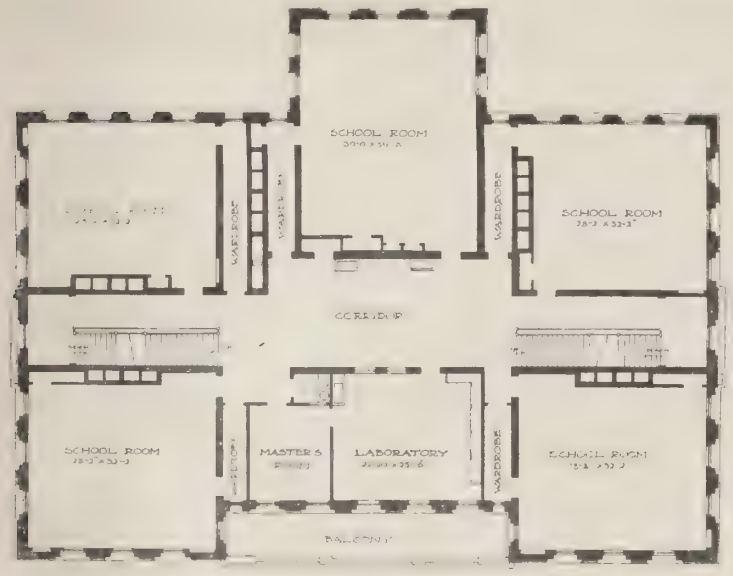
The Brooks School has single run of sash, while the Newton school has double run on the north, east, and west sides; but the Newton school has but six windows in a corner schoolroom, while the Medford school has in such rooms seven windows. The Medford school has schoolrooms of the maximum dimensions for the grammar grade 28 by 32 ft., while those of the Newton school are 26 by 32 ft. The Newton school, however, devotes a greater proportionate area to wardrobes, since they are placed in this building as adjuncts of the schoolrooms, but enclosed by solid partitions and each having two doors, — the arrangement of wardrobes generally required in our graded schools.

In the Medford school two large wardrobes serve on each floor six schoolrooms. The wardrobes are practically a part of the corridor, but are arranged with more ample vent ducts than are usually provided for corridor wardrobes. The schoolrooms in the Medford school have a stud of 13 ft., and the stud of the schoolrooms in the Newton school is but 12 ft. There is, however, about the same amount, relative to the size, of foundations and exterior brickwork in each building. The Medford school has wooden-lathed ceilings above basement, and the Newton school has wire-lathed ceilings throughout.

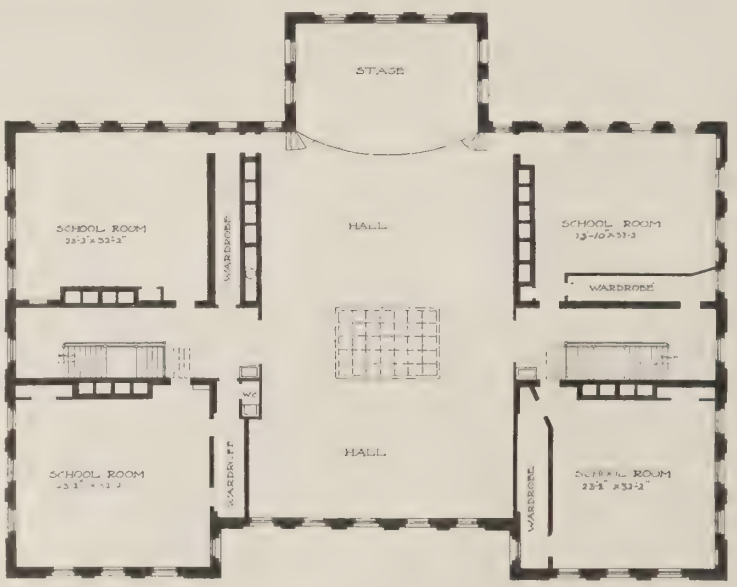
From the foregoing comparison of costs we may credit the Newton school with about $210 per schoolroom; but as we have debited it with $165 on account of its size, we have yet to discover



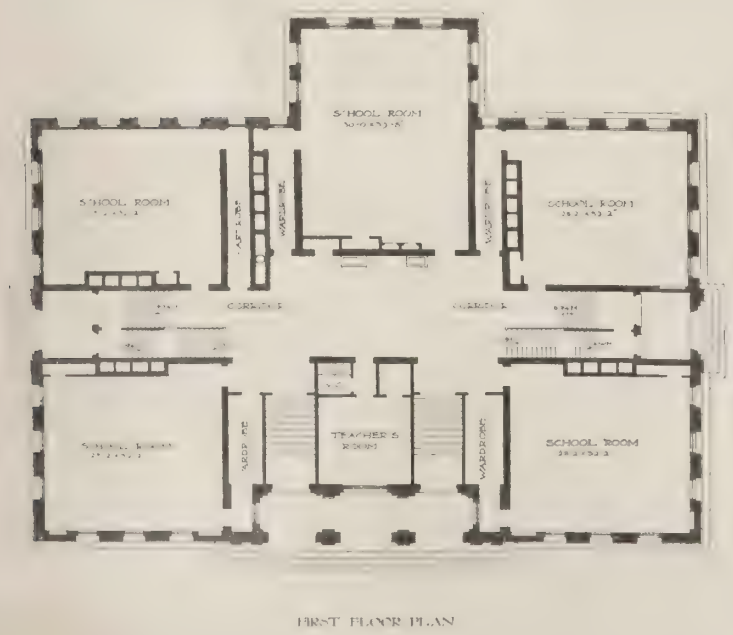
AGASSIZ GRAMMAR SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.



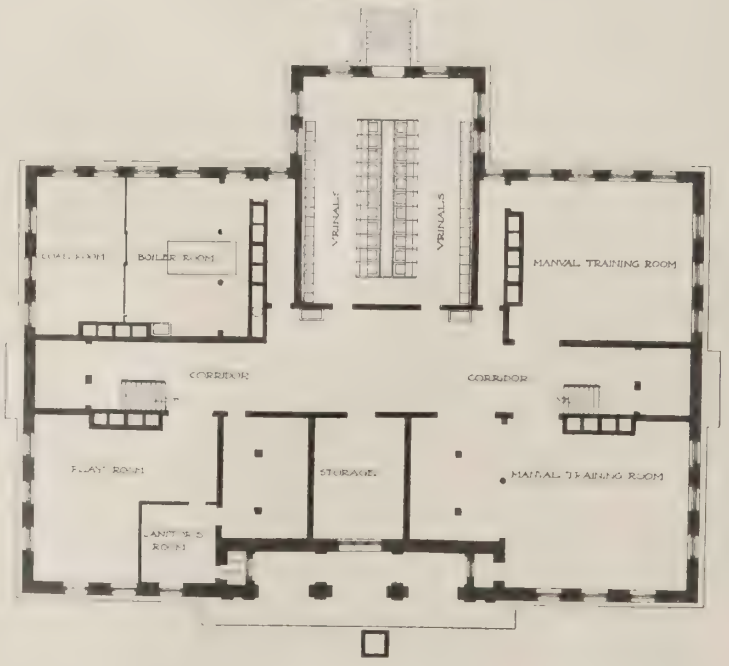
SECOND FLOOR PLAN



THIRD FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT PLAN

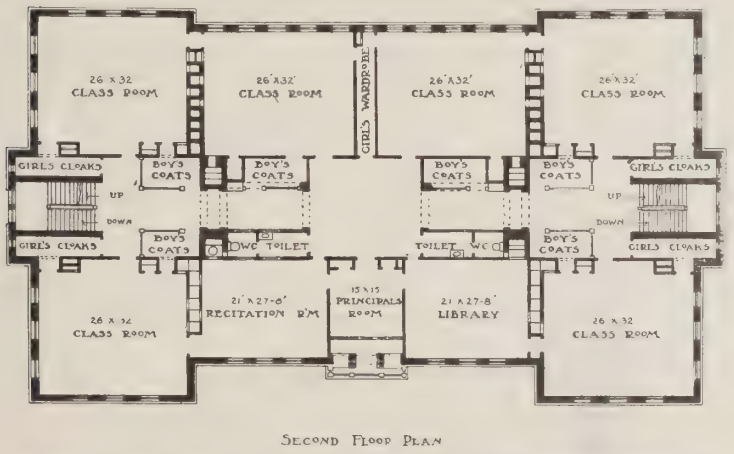
AGASSIZ GRAMMAR SCHOOL, BOSTON, MASS.

the reason for the difference of cost of the two schools. Examination of the plans of the Medford school will show, however, that there are elements of cost which more than account for this apparent discrepancy. In both schools the basement partitions are brick, but the bearing interior partitions in the Brooks School are also all of brick or steel columns and beams, while those of the Newton school are spruce studding; and in the Brooks School all the heat and vent shafts are brick, but in the Newton school two of these shafts are of galvanized iron cased in stud partitions. It is evident, by the sufficiently accurate calculation of the relative cost of these different forms of construction, that the greater expense per schoolroom of the Brooks School is caused by the interior brickwork which the Newton school lacks. The Brooks School, as a result of the consideration of all these factors of cost, presents a relative advantage of economy over the Newton school of about $50 per schoolroom, which may in part be ascribed to the possibly less general cost of building in Medford than in Newton.

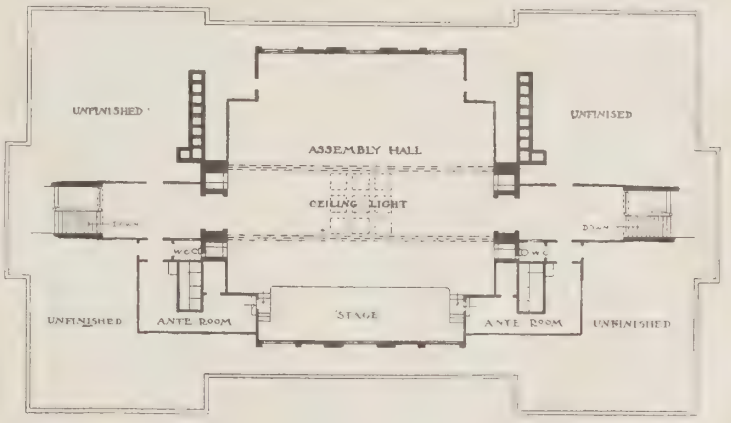


PIERCE GRAMMAR SCHOOL, WEST NEWTON, MASS.
Stickney & Austin, Architects.

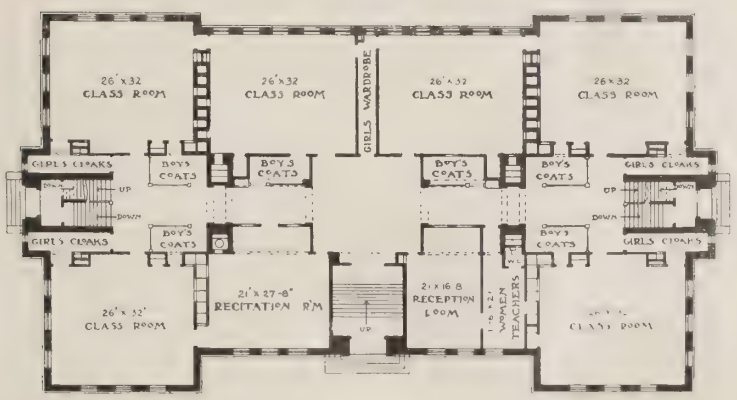
The architects of the Newton school would have preferred to have used the more solid construction adopted in the Medford building, but the necessity of meeting within a limited appropriation the fixed requirements of the buildings precluded the possibility of this construction if other and possibly more essential features were to be embodied in the structure. As the partitions and floors of the Newton school are fully protected by fire-stops and wire lathing, and as all the basement partitions, as in the Medford school, are of brick, the chief practical disadvantage in having the bearing partitions of studding is the probability of trouble from shrinkage. In cases where interior brick walls involve too great expense the light steel bearing partitions covered with wire lathing and cement, which have lately come into use, while somewhat more expensive, are certainly to be preferred to partitions of wood studding, even when they are wire lathed and fire-stopped. Certainly in a schoolhouse no bearing partition should be constructed without fire-stops. We have fixed at $80,000, or $5,000 per schoolroom, the normal cost of a building of the type of the Agassiz School, when given no richer external treatment and no thicker brick walls than the Newton. Why is it, then, that the Brooks School, a smaller building, and hence, other things being equal, normally more expensive per schoolroom, costs but $4,285 per schoolroom?



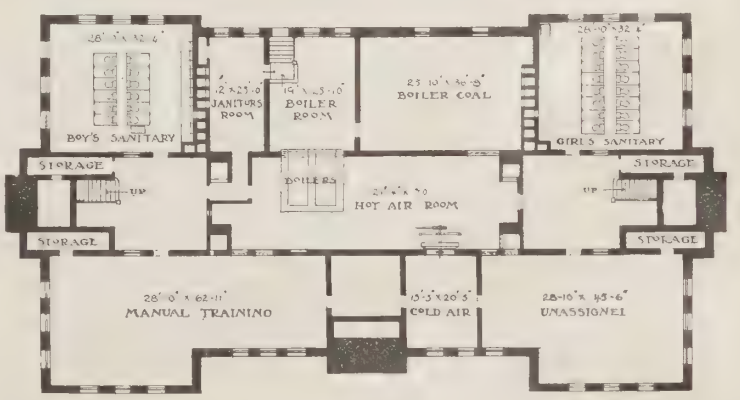
SECOND FLOOR PLAN



THIRD FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

PIERCE GRAMMAR SCHOOL, WEST NEWTON, MASS.

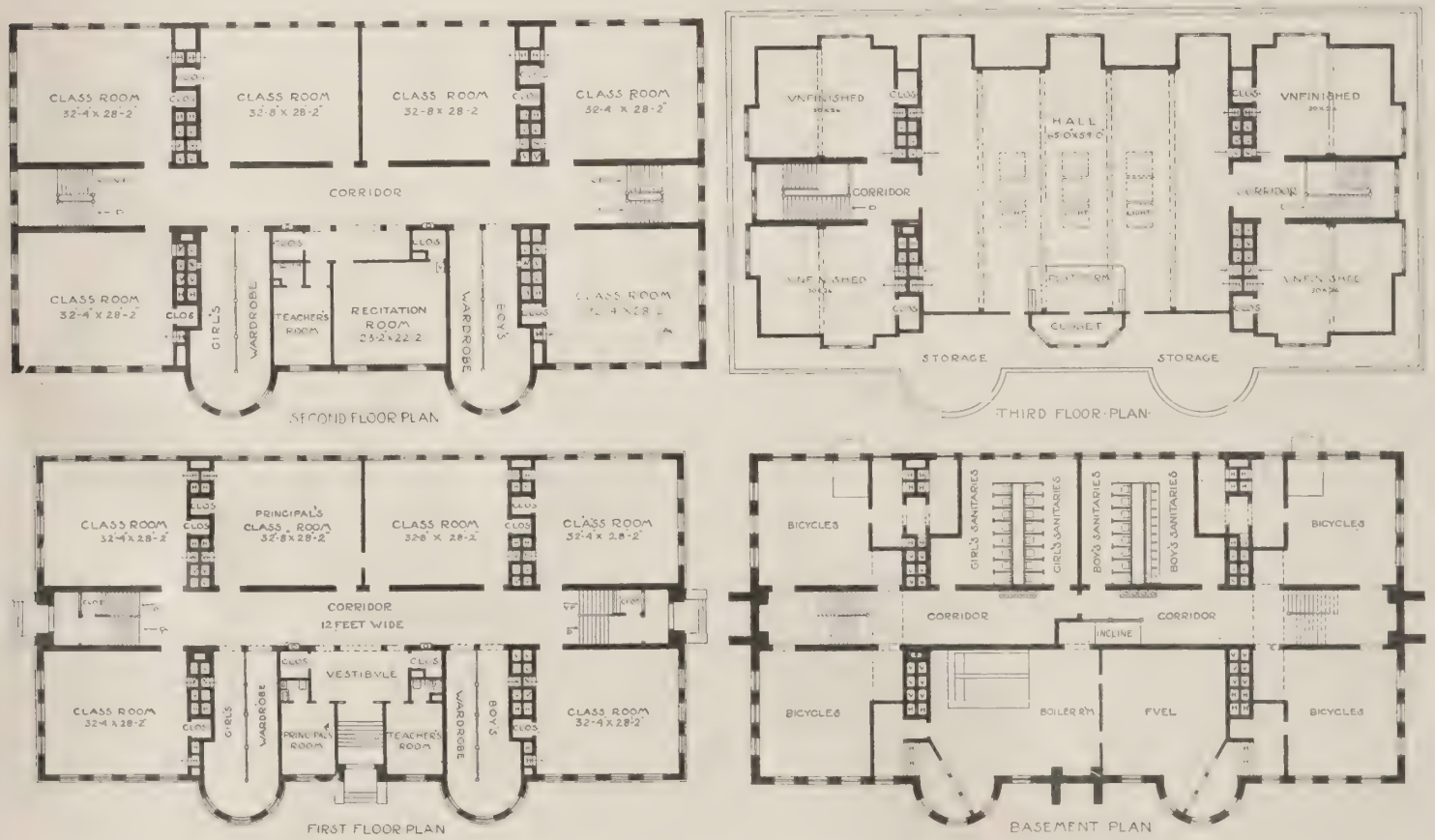
Of this difference in cost of $715 per schoolroom we can account for about $150, by taking into consideration the more expensive external treatment predicted for the Agassiz School, together with certain features noted earlier in this paper, which, while desirable, are more costly than the substitutes used in the Brooks School. Further,

the Agassiz School has 19 ft. greater height from basement floor to top of exterior brick walls. The interior partitions are brick or terra-cotta lumber, while in the Brooks School the carrying partitions only are of brick and the others are of ordinary wood studding. The arrangement of separate wardrobes adjacent to schoolrooms given in the Agassiz School increases the amount of partitions and the number of doors, as well as adding to the proportionate area of the building. The Agassiz School has



BROOKS GRAMMAR SCHOOL, MEDFORD, MASS.
Wales & Holt, Architects.

cost due to the larger size of the Agassiz School. This is, as noted above, about 4 per cent. for each additional pair of schoolrooms, amounting in this case to $190 per schoolroom. There stands, then, to the credit of economy of construction of the Brooks School above that of a building of the type of the Agassiz School, constructed under the assumed conditions, $155 per schoolroom; *i.e.*, the Brooks School would appear to have been 3½ per cent. less expensive than the hypothetical building with which we have



BROOKS GRAMMAR SCHOOL, MEDFORD, MASS.

double run of sash in all schoolrooms, while the Brooks School has single run only; the former school has first floor of mill construction and wire lathed in the upper stories. The Brooks School has wood-lathed ceilings, except in basement, where the ceiling is wire lathed.

An estimate of the difference of cost due to these differences in construction shows that the Agassiz School cost $600 more per schoolroom on account of these features.

Adding these to the difference of cost found above, we find that there is to the credit of the hypothetical Agassiz School now under consideration, $35 per schoolroom.

We have not yet taken into account the percentage of lessened compared its cost, while giving credit for value to be received in the school of the Agassiz type, as above considered, from the features of plan, construction, and detail, which will be recognized as desirable when they can be afforded.

It might be possible by closer comparative survey of quantities and closer study of other conditions to account satisfactorily for this slight difference of cost. This appears, however, to be unnecessary. The result attained, taken with the preceding analysis, sufficiently demonstrates that the cost of schoolhouses, where designed by skilled architects, depends upon the demands of the clients in regard to plan and construction.

Architectural Terra-Cotta.

BY THOMAS CUSACK.

COOPERATION BETWEEN ARCHITECT, ENGINEER, AND CLAY-WORKER.

IN that branch of the main subject on which we have recently been engaged, the use of steel as an auxiliary support has received some attention. It has, of course, been viewed chiefly from the standpoint of the terra-cotta manufacturer, but without prejudice to the allied interests involved. An effort has been made to facilitate the whole process of execution by avoiding cumbersome or needlessly complicated methods of construction. It is by adopting simple expedients, and by using the most readily obtained or easily made appliances, that we get a maximum stability at a minimum cost. We shall endeavor to illustrate this general proposition in greater detail, as heretofore, by the help of typical examples taken from current practise. The connection between steel and terra-cotta in its widest sense, however, may now be reviewed as a useful preliminary to a purely technical discussion of the several branches of our subject.

While the introduction of the steel frame gave an undoubted impetus to the use of terra-cotta, it did not in anywise tend to lessen the numerous exigencies already incident to its manufacture. With an increased demand, and a very alluring vista of possibilities, there came peremptory calls for unfamiliar, if not impossible, shapes and sizes. Coupled with these came newfangled notions of attaching them to the skeleton, which, when not altogether visionary, were often rather perplexing. Methods and maxims which had withstood earlier vicissitudes, and whose existence hitherto was obviously a survival of the fittest, were soon at a discount. The ways and means that had been sufficient in a modest, self-supporting class of work were no longer adequate under new and more exacting conditions. In fact, the business that followed was to some extent a new one; and, being greatly increased in volume, the ranks of those engaged in it became filled with men of necessarily limited experience. This also, for a time, placed the terra-cotta manufacturer at an additional disadvantage. Hitherto he had been able to discuss and determine all questions with the architect; who, in view of the points involved, would usually agree to any well-considered alternative that might be proposed in jointing or otherwise. With the advent of an independent skeleton, he soon found that a new terror had been added to his already onerous existence. The architectural engineer — a veritable man of iron — had now to be reckoned with.



FIG. 48. THE DUN BUILDING, NEW YORK CITY.
Harding & Gooch, Architects.

This last-named gentleman was also a new, but very necessary, element, though at first — and we think with great injustice — considered one of doubtful import. He has been called an intruder, a Philistine, and, cruelest cut of all, a man "incapable of esthetic emotions." During the early years of his existence he received scant recognition, more especially from such as could not brook a rival near the throne. The first of these allegations has been abundantly disproved, and for the other two, he seems to have allowed judgment to go by default, as he could well afford to do. In reality he is but a product of altered conditions, possibly a little forced as to time, but withal a perfectly natural growth. There was a place for him; and, perhaps, owing to his training in that regard, he managed to find it without undue effort on his own part. Whether acting in a purely professional capacity, or in the dual rôle of contracting engineer, we have, in the course of business, had many opportunities of detecting flaws in his armor. There have been differences of opinion, arising chiefly from the different points of view, but on no occasion has there been reason to question his credentials, or regard him as other than a friend and a brother. We shall have to take issue with him presently on certain points wherein he has at times shown a lack of consideration for men and things other than himself and his belongings. This, however, will be done in good faith, and with the respect due to a coworker.

A basis of agreement between architect, engineer, and terra-cotta manufacturer, on which mutual help may be rendered, is suggested by the interdependence of the two materials called into service in every operation on which they happen to be conjointly engaged. While each of them is serviceable, and, to some extent, necessary, neither of them is absolutely indispensable. They have widely different duties, it is true, but their several performances are part of a complete whole; the more perfect when performed in conjunction rather than isolation, in agreement rather than discord. Thus, if terra-cotta has in some cases to be re-enforced by iron, so, also, and to a much greater extent, is the skeleton dependent upon the clothing with which it is made presentable. Deprived of this protection, its existence would be imperiled by atmospheric action. By such protection, and by it above all others, if not by it alone, may the structure be rendered invulnerable when attacked by fire. The analogy holds good, and applies with equal force to the relationship existing between men whose business is to make the best composite use of these increasingly popular materials.

The advantages of consultation and cooperation such as that on which we are about to insist must be apparent; yet we are not sure that the importance of that line of procedure is so generally recognized and acted upon as it ought to be. The need for a common understanding is, we believe, conceded on all sides as an abstract proposition; but its application in every-day practise is too frequently overlooked, and if not altogether forgotten, is sometimes resorted to as an afterthought, in the hope of surmounting consequent exigencies that need not have arisen. Theoretically, our proposal is not a new one, but we would give it a new reading, encourage its development, and make it more of a tangible reality than heretofore.

So far as this plan has been tried the results have been reassuring, and encourage the belief that it is the logical outcome of existing conditions. Cumulative and confirmatory evidence as to this could be adduced by citing the favorable opinion of leading architects in support of it; but it is hardly necessary to add such indorsement to that which is not likely to be seriously contested.

It may be opportune to note at this juncture that the examples of steel and terra-cotta construction selected for illustration in THE BRICKBUILDER during the past year were the result of consultation, concession, and mutual agreement. They do not, for instance, represent the individual opinion of any one man, but may be considered the embodiment of the best possible advice made by, or accepted by a number of men, each one something of a specialist in his own particular line. It is to this fact, no less than to the actual test of service, that they owe whatever of interest or value they may be said to possess.

the flange of a cast-iron lintel in the manner shown in section at *A*, Fig. 49. The terra-cotta voussoirs were of sufficient depth to be self-supporting, and were not obliged to depend on these iron lintels. Had that not been so, however, the insertion of this flange at the point indicated would have been a doubtful expedient. It is placed too high, and enters so far into the block as to become a source of weakness. The voussoirs, being deficient in tensile strength, would have had a tendency to crack from chance knocks or unequal pressure at this, their weakest point; in which case the portion suspended below and not resting on the flange would have had no support whatever. This objection having been pointed out to the architects' representative, the cast-iron lintels were at once modified to the extent shown at *B*, Fig. 49. This apparently unimportant change was an undoubted gain in the strength and security of the terra-cotta arches, with rather less expense on the part of the iron contractor. On the

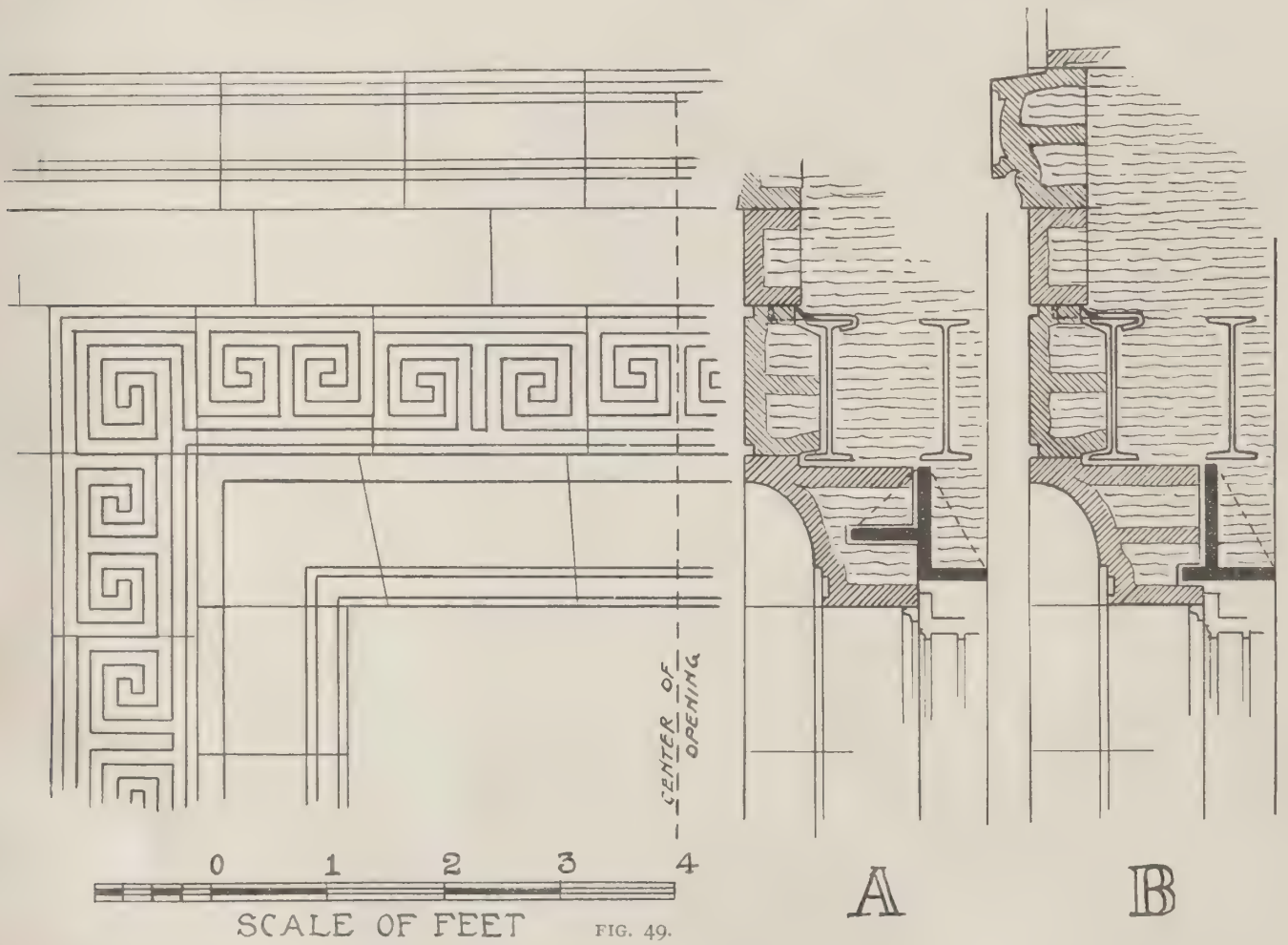


FIG. 49.

At Fig. 48 we have an advanced type of the steel frame with terra-cotta and brick walling in process of erection. Here, too, the several interests referred to have contributed something towards the sum total of its maturity, as it emerges from below the sidewalk, rising rapidly into space. At the date of writing it is nearing completion, the very substantial envelope of terra-cotta having proved a remarkably good fit for its anatomy of riveted steel. The skeleton had reached its full height before any of the terra-cotta had been set, and similarly, the manufacture of the latter was being advanced while most of the former existed only on paper. This made it incumbent on all sides that the points of contact between the two materials should be predetermined with the greatest accuracy, and adhered to in the execution of each from start to finish. The methods of attaching them had not been settled beyond recall when the contracts were closed, but were ultimately — within reasonable limits — based on the advice or concurrence of those who were responsible for the due performance of that duty.

We know of a building in which it had been proposed to insert

whole, we think there has been no reason, here or elsewhere, to regret the introduction of the principle for which we are contending.

In the practical application of this process of adjustment an occasional hitch may occur on small questions of precedence and priority, etc., but a little time and patience will bring about the needful assimilation, and the force of circumstances can be relied on to regulate conflicting ideas, where other influences appear inadequate. If the parties concerned are actuated by an honest desire to obtain the best possible solution of a given problem, they will not throw away time or thought upon trifles, but welcome the wisest suggestion to that end, without much regard to its parentage or antecedents. Good ideas may be, and, indeed, have been damned by faint praise; they may suffer a temporary eclipse at the hands of those who do not understand, or are prejudiced against them; but if sound and practicable, whatever their origin, they usually command a respectful hearing, and in the end cannot fail of adoption. Meanwhile, few will deny the validity of the words attributed to the wisest of men: "In a multitude of council there is safety."

REPORT OF THE COMMITTEE ON ARCHITECTURE AND GROUNDS OF THE TENNESSEE CENTENNIAL EXPOSITION.

THE report of the Committee on Architecture and Grounds of the Tennessee Centennial Exposition, a portion of which is herewith presented through the courtesy of Mr. Ernest Flagg, a member of the committee, is of interest to those who have visited Nashville as well as to those who know of the buildings only in a general way. Intelligent criticism of architectural work is seldom obtainable, and honest expression of educated judgment, free from either lavish condemnation or indiscriminate praise, should always be welcomed. The report considers the buildings and the grounds in a perfectly impartial light, and the conclusions are logical, and based upon sound principles of architectural taste. If our public buildings were more often criticized in this same way the profession would be a vast gainer thereby.

GENERAL REPORT ON BUILDINGS AND GROUNDS.

In all great expositions the chief exhibits are the buildings and grounds. These are more in evidence, more seen and commented on than all the rest besides, and upon their success or failure in fulfilling their functions must hang, to a great extent, the fortunes of the enterprise. These functions are twofold, esthetic and practical. Their beauty should attract multitudes to see them, and they should tend to elevate and improve public taste. They should be arranged so as to display the exhibits to the best advantage, and as far as the means will permit, the buildings should themselves be an exhibition of modern methods of building of the most advanced type as regards construction, materials, and design.

The grounds should be laid out with a view both to convenience and beauty. They should be planned to preserve the natural advantages of the site, if any, to serve as a setting for the buildings, and to facilitate communication between them.

The buildings and grounds are necessarily so closely connected that one cannot be intelligently planned independently of the other. They each form a part of a general ensemble, the plan of which should be laid out and controlled by one mind.

In judging of the present exposition, it is necessary to take into account the financial limitations and the other difficulties encountered in carrying out the work. It is not always possible to realize the ideal, however distinctly conceived, with unlimited means at command. It is still more difficult, if not impossible, to do so when, through inexperience, no correct ideal exists in the minds of those in charge of the work, and the means are limited. In the present case it was extremely unfortunate that no competent supervising architect was employed as director of the general scheme of the buildings and grounds, and it was unfortunate that the plan which was adopted should have been interfered with and injured by the demands of certain of the exhibitors and by local interests.

While candor compels one to admit that the general effect of the exposition might have been greatly improved by a more skilful disposition of the parts (as will be indicated hereafter), yet the plan was so far successful as to give generals atisfaction to the majority of visitors.

The site is a fine one on the high land to the southwest of the town, toward which it slopes, so that from all parts of it there is a fine view of the city. Any view of Nashville is interesting, and from no place more so than from the exposition grounds. The capital city is dominated by the Capitol Building, which stands upon an eminence in its very heart, its base being well elevated above the roofs of the surrounding buildings. The central axis of the exposition was made to coincide with the main transverse axis of this building. It was a very happy thought to place the chief building of the exposition upon this axis. The other buildings of the group were, in general, placed about it so as to enclose an irregular quadrangle, having a broad opening in the center of the side toward the town. This opening was occupied in part by an artificial lake of irregular outline, spanned at its narrowest point by a bridge, an imitation of the Rialto at Venice, also located on the main axis. Here, evidently, was the place for the main approach, and here it appears to have been placed in the original plan. If this plan had been carried out, nothing in the way of an approach could well have been finer; but local interests interfered, and the scheme was abandoned. Nor was this the only detrimental change in the original plans. Buildings were allowed to encroach upon the quadrangle in such a way as to almost completely destroy its effect. Thus, instead of a grand entrance, as originally intended, by a broad avenue connecting the exposition and the town, located on the main axis of both, the approach was relegated to a corner of the grounds, and the quadrangle was cut up and disfigured by buildings, generally the poorest of the group, placed without regard to the others; so that upon entering the grounds one would never suspect that there had been any preconceived general plan, but rather would suppose that the buildings had been placed about at haphazard. So completely was the first plan damaged by these unfortunate changes, that it was only from the bridge that one could understand what the effect might have been.

If we consider the general appearance of the buildings themselves in relation to one another, one cannot but regret the difference in scale between them, and the irregularity of their placing. If the simple expedient adopted at Chicago, of keeping their main cornices at the same level, had been used here, the general effect would have been far more harmonious, and if the lines of the great quadrangle had been laid out with regularity so that its sides were parallel, and the buildings in line, there would have been a decided gain in dignity, and in the simplicity which always accompanies it. The effect of the group might also have been improved if the Parthenon had been placed farther back, that is to say, to the southwest, which would have given it greater importance, as there would have been more space in front, and a finer approach. Moreover, the very inharmonious effect of the Commerce Building as a background would have been avoided.

The chief feature of the exposition, and the one which will make it memorable, was the full-size restored model of the Parthenon at Athens, just referred to; a copy in plaster of the exterior of the greatest work of art the world has ever seen; a monument which will doubtless ever stand as the highest achievement of the handiwork and taste of man. Though in the nature of things this model was scarcely more than a scenic reproduction of the glorious Athenian temple, it served better than a description or drawing could to give the beholder an idea of the original appearance of its exterior. Though constructed of flimsy material, of imperfect workmanship, and in the midst of uncouth and inharmonious surroundings, this model was beautiful beyond the power of words to express. Who, that saw this poor shadow of the original building, has not asked himself, What must the building itself have been, when it stood in its perfection the shrine of the goddess, with its incomparable setting on the Acropolis of Athens, surrounded by masterpieces of Grecian art, constructed of the great blocks of purest Pentelic marble, filled together with a perfection of workmanship surpassing the skill of modern times to imitate, alive with statuary of such exquisite beauty that the very battered fragments which have come down to us serve as the criterion of plastic art? What has the world not lost in the destruction of this pile?

Having seen the exterior, one could not help wishing that an attempt had been made to complete the model by restoring the interior also. This might have been accomplished with little loss, for as an art gallery (for which it was used) it served the purpose only fairly well. It did not lend itself happily to such usage. The light was too feeble and too high, and the wall surface of limited extent, so that many of the pictures were skyed for lack of space.

Although comparisons are odious, one may say, without injuring the feelings of the most sensitive, that this model of the Parthenon, imperfect though it was, was immeasurably superior to any of the other buildings of the group. Its simple majesty and masculine

beauty dwarfed them into insignificance, but their presence was annoying; one could not help wishing for a view of this extraordinary structure without their disturbing influence, and it is much to be hoped that the model may be preserved for a time, at least, after the other buildings are removed, so that it can be seen by itself.

As a lesson in art it ought to serve a very precious purpose. Who can look at it and not blush for the art of the nineteenth century? Who can look at it and not wish that we Americans might emulate the ancient Greeks and produce an art of our own, and a national style that might vie with theirs?

It is believed that the prototype of the Grecian Doric order is to be found in Egypt, and doubtless this is true. An architectural style cannot be created offhand, it is invariably the result of evolution, depending for a basis upon what went before, and developed by countless minds working in unison through the ages, rising or falling in artistic excellence with the taste of the times. We have no national style, we copy whatever suits our fancy, and make little progress in art, for we are working at cross purposes.

The lesson which the Parthenon teaches, if we understand it aright, is this: That good art must be modern art. No work has ever retained a lasting reputation as a masterpiece of art which was not modern, and in the style at the time it was made. And no such masterpiece has ever been created which did not belong to a great art epoch. Masterpieces are not isolated productions. They can only be created when the whole artistic feeling of a race has been elevated to a high plane. If art is to reach a high plane here, the growth must be along healthy and natural lines. We will not reach it by copying the works of others, even though they be the Greeks. Our art must be based on reason, that is, it must call into play the highest faculties with which we have been endowed by the Almighty. We must think. The forms must be adapted to the materials used, the purpose for which they are used, and to the mechanical methods used. The Greeks worked in this way, and so have all other people who have achieved distinction in art. In architecture, our crying need now is for a national school, where our young men may be taught how to think, and to understand that good design must be based on common sense; where they may receive instructions from the foremost men in the profession, just as the architectural students in the great French School of Fine Arts receive their instructions from the foremost practising architects of France.

An excellent illustration of what has been said is furnished by the building represented by the Parthenon model and the Auditorium Building of this exposition. The Parthenon model represents a building built twenty-five hundred years ago, which, at the time it was built, was the very personification of reason, and the highest development of the modern art of the times; every feature tells its story, every detail is fashioned in such a logical way to serve the purpose for which it was designed, that any one can see its use, and follow the beautiful working of the mind that designed it. With such simplicity are the parts assembled that a little child can understand their meaning, yet with such skill that the most impassive soul must be moved to awe and reverence as he beholds its sublime beauty, its calm dignity and perfect repose. On the other hand, let us in all kindness examine the Auditorium Building. Is there anything about its exterior to express the purpose for which it was intended, the method of its construction, or the nature of its plan? From the outside it appears to be a rectangular temple with a square tower piercing its center. Inside it is an oval apartment, and the tower has disappeared. Outside it indicated stone construction, for the forms of the moldings and other details are adapted to stone construction. Inside we find it is built of wood. Outside it appears to be a building of the debased art of the sixteenth century; inside it appears that it is a temporary wooden building of the nineteenth century. Is this logical? Could the Parthenon ever have been produced among people who employed such methods? Can good art ever proceed from falsehood? If we have an auditorium to build in wood for an exposition of the nineteenth century, why should it not appear to be what it is? Why do we not use the material at hand in a natural way, adapt the forms to the materials, and make the outside tell the story of the inside, letting it frankly appear as a building of the present day? What is there to be ashamed of? To expect a good result with the methods of design and construction



TENNESSEE CENTENNIAL EXPOSITION.

This illustration is made from a lithographic print, issued by the management, and is intended only to give a general idea of the grounds and buildings.

used here would be as senseless as it would have been for the builders of the Parthenon (supposing they could have done so) to have designed the Parthenon to represent an auditorium for a fair of the nineteenth century, and then expect it to be successful as a temple to an Athenian goddess. The same thing is true to a greater or lesser degree of all the buildings of the exposition. The designers are not so much at fault as the taste of the times. They did the best they could according to their lights, and did they not have the illustrious example of the Chicago Fair before their eyes to lead them astray?

Let us hope that a new epoch will dawn, that the time will come when we may design our expositions in the light of reason and common sense; when, profiting by the example of the French, we may seek to make the buildings mean something, as illustrating modern methods of construction, and the use of the new materials which are being almost daily placed at the disposal of the architect by modern science, and also illustrating modern design suited to the present requirements.

When that time comes, we shall be on the high road to a national style, a style adapted to modern wants, and we shall be on the high road to good art, the same road trod by the ancient Greeks, which made the Parthenon possible, and the Greek name a synonym for art.

REPORT UPON THE BUILDINGS IN DETAIL.

Considering the buildings, then, not as structures which speak their function in the character of the exterior, but as examples of composition along classic lines, it is interesting to refer to a few details.

Many of the designs show schemes of composition that would, with study, produce excellent results. The Government Building is probably the best on the grounds, after the Parthenon, and it is to be regretted that its effect was marred by its surroundings. Its general proportions were pleasing, and its details simple and good; the segmental ends terminated the building gracefully, and were in harmony with the central dome. The dome, however, may be criticized for its heaviness and dry outlines, and it is not easily understood why such awkward pedestals should have flanked the main entrance.

In the Commerce Building, especially, has a noble scheme been poorly carried out. While its general grouping was one of the best, the central motif was confused, the first story flat, and the pediment sculptures inadequate. The dome with glass enclosures produces a flimsy effect, and the corner pavilions were badly cut horizontally.

The Hygiene Building had an excellent porch, but the doors behind the columns were too contracted and the sculpture masses against the sky too slight. This is better than the Commerce Building, however, in that it is less pretentious.

Again, in the mass the Negro Building, the Machinery Building, and the Agricultural Building were pleasing, the first perhaps the best of the three and most festive, although the central entrance was too diminutive, and the cross-bar filling to the openings overdone. The second was small in scale, but the high-up windows afforded excellent wall space for exhibits. Of the third, the lack of simplicity is the chief criticism; at one and a half the size the parts would not be so crowded. Many of its individual parts are excellent, and the exterior conforms to the arrangement of the plan.

The History Building and the Children's Building were smaller than the others, and very attractive. In the former, the portico, which we suppose is a copy of the Erectheum, was gracefully comprehended, and in the latter the composition was very well expressed, although the ornament was of an inferior character.

The Auditorium, already mentioned, was, with perhaps one exception, the least attractive of the buildings; its lack of harmony in plan and exterior, and the absurdity of the tower over the center of the assembly room are in keeping with the awkwardly arranged corners and the unstudied details.

The exception referred to is the Women's Building. It scarcely seems possible that columns could be so clumsily designed, that they could be made to support so ridiculous a cornice, and that any one should think of crowning such a building with a temple, the absurdity of whose scale is only equaled by its function as a roof garden.

The Minerals and Forestry Building, the Horticultural and Transportation Buildings scarcely call for mention.

It is a pity that the Memphis Building should have had so important a place; its color, form, and details did not in anywise warrant it.

It was a happy thought that provided so much green lawn, and it was a kindly summer that kept it green. Great credit is due to the gardeners who laid out the trellises and the flower beds. The radial design at the end of the Forestry Building, and the hanging vines in the basin of the Water Nymph Fountain were most charming.

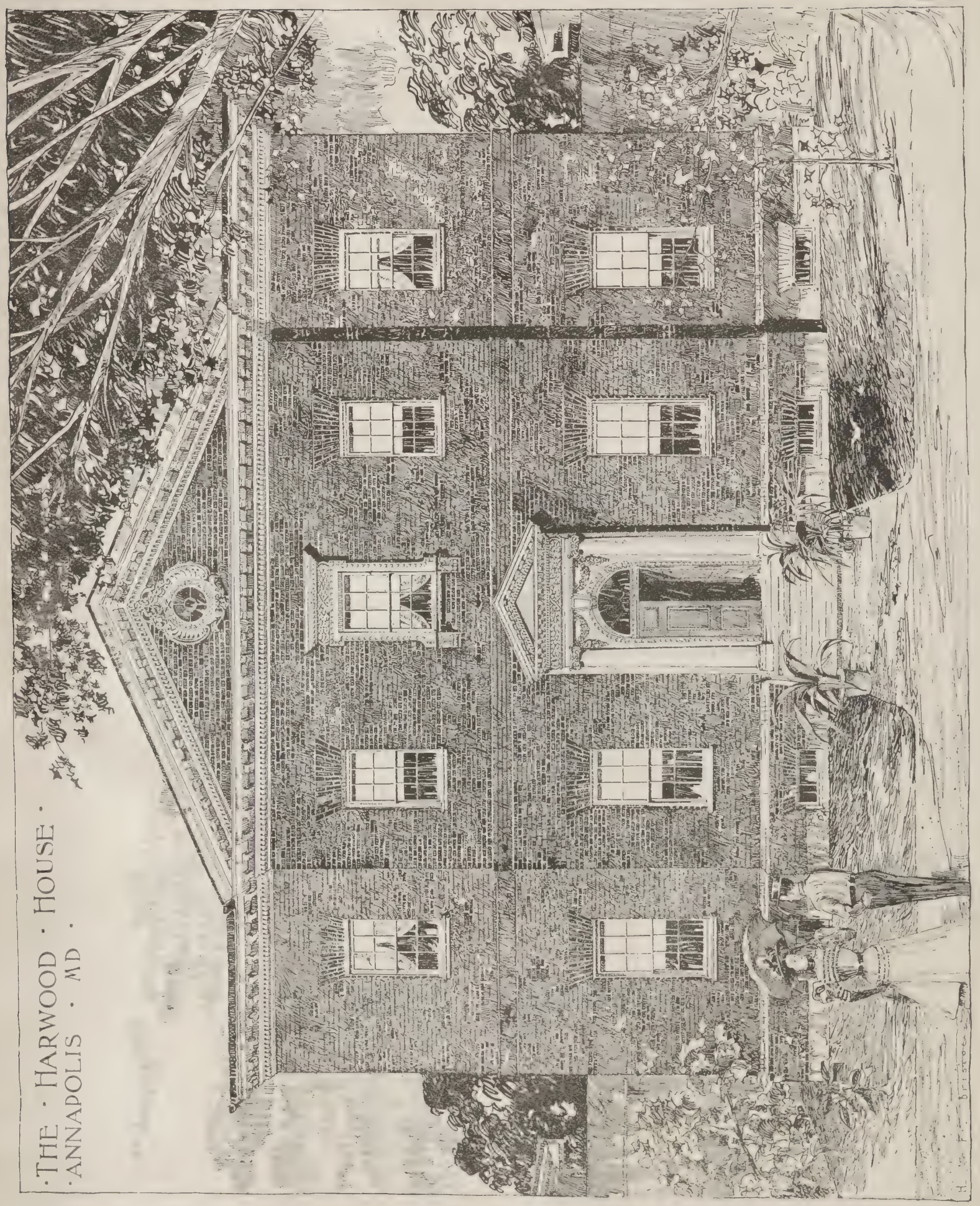
THE DISINTEGRATION OF CLAY BY FROST.

THERE are many experiments to prove that water expands in the act of passing into ice. It may be useful to briefly describe one of these; then, when we come to the application of the principle to the disintegration of clay, it will be plain sailing. An experiment, which might be termed classical, was performed by Major Williams at Quebec. He took a 12 in. shell and filled it with water, closing the orifice with a wooden plug. He then exposed it to the open air, the temperature of which was, at the time of the experiment, 18. degs. below zero (Fahrenheit). The consequence was, that when the water froze the plug was driven to a distance of about 100 yds., and through the orifice there immediately came an icicle 8 ins. in length. The bulk of this icicle, of course, represented the amount of expansion. In another case the shell itself was rent, and a sheet of ice came through the crack. This evidently settles the case of the bursting of the water-pipes. Indeed, the very fact that ice will float on water shows that water expands in freezing. It may be mentioned, by the way, that all liquids do not behave like water in solidifying; for while on the one hand we have ice, bismuth, and cast iron contracting as they pass into a liquid, on the other hand we have mercury, phosphorus, paraffin, and spermaceti contracting as they pass into a solid.

The effect of freezing water on rocks may be seen in quarries, in the weathering of cliffs, and in the production of landslips. If the rocks are not very porous, plenty of water will still find its way through them by means of cracks, and on the freezing, and consequent expansion, of this water there will be a dislodging of blocks of rocks, sometimes of great size. This disruption of the rock by frost is, of course, of great utility sometimes, and is accordingly taken advantage of by the quarrymen. In very porous rocks, however, the tendency of frost is to crumble and disintegrate them. When, for example, a stone full of its "quarry water" is exposed to intense frost, it will often fall to pieces.

There can be no question that the exposing of the clay to the open air, and its consequent weathering for some months, is of distinct benefit to the clay. Some brickmakers, however, seem to think that it is hardly worth while to let the clay ripen in this way, and accordingly they use it freshly dug, contending that "the weathering of clay is of no real benefit to the finished article, but will only lessen the labor and expense of mixing and preparing the clay before use." With this statement we cannot agree at all, for the exposure of the clay to the weather has a twofold effect, both tending to improve the quality of the clay, and thus to benefit "the finished article."—*British Clayworker.*

THE first half of the last century was rather remarkable for the development of the brick and tile industry. At Mount Vernon, for example, which was built in 1734, a curious variety of plain and molded bricks, paving tiles, and copings is still to be seen, and examples of molded brick water-tables and of floor-tiles, both square and octagonal, dating from the same period, are still quite numerous in the Eastern States.— *American Architect.*



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Fire-proofing.

MR. HOWARD CONSTABLE, in a recent address before the Boston Society of Architects, made the statement that he believed he could with cement construct a fire-proof floor which would be equal to the best terra-cotta construction, and, on the other hand, he could with terra-cotta make a floor fully equal to the best construction of concrete. We would not carry the comparison quite as far as Mr. Constable, or even hardly to the extent of admitting that either proposition represents entirely our personal belief, as we have yet to be convinced that any material has as yet been suggested and put on the market which can hold its own, after fair, impartial tests with terra-cotta; but we interpret his statement as implying that in the present state of the market and of the science, the value of fire-proof constructions lies very largely in the details, and that the success of any application in this direction is measured not unfairly by the ease with which it can be adapted to practical exigencies and made readily available in the hands of the ordinary workman. We have repeatedly emphasized the necessity for increased attention to details. Terra-cotta undoubtedly has the large lead over anything else at present offered for the protection of steel in a building, and its efficacy has been tested in the very best manner, that is to say, in constant daily practise, but it will not do for our manufacturers of fire-proofing material to feel that the last word has been even suggested. The principle involved in the use of terra-cotta is admittedly a correct one, but in order to insure the best results we need not only the proper material, but its proper application, a proper variation of its employment for specific cases, while beyond this there must be a constant attention to matters of pure arrangement and plan. It is not fair to build a structure in such a way that a slight conflagration can develop the heat of a blast furnace, and then complain if the fire-proof material yields. We would admit at the very start that under certain conditions nothing is absolutely fire-proof. Therefore, if we wish to have fire-proof buildings, we must have not only the fire-proof material, must not only use it in the best and most advantageous way, but must so plan our structures that the inertia of conflagration, which is a very large element of danger, can be checked at the very start; and though the chief reliance can be upon the protection of the steel skeleton, the building as a whole must present decided obstacles to the spread of a fire, even through its contents. It is safe to say that in no building where these principles were fairly considered has the terra-cotta ever been found wanting. The cases where it has failed to give efficient protection are those wherein the details were either improperly considered in manufacture or were not thoroughly carried out in execution. A workman laying terra-cotta skew-backs along a built girder, for instance, is quite as likely as not to disregard any inequality in the metal, such as splice plates, stiffening angles, etc., and make up for that irregularity by such cutting and so called fitting of the blocks as would weaken them and cause them to fail at a critical time. We have known an instance of terra-cotta arches between steel beams which were put in place in such condition that upon the application of a certain amount of heat the lower flange revealed a crack, allowing the material to drop and admitting fire into the interior of the rod to such an extent that the steel tie-rod was melted entirely off. Manifestly, such condition was no fault of the material, but was chargeable to poor construction, and we have no doubt that there are many points in the fire-proofing of our large buildings which would fail in an excessive test and would apparently give ground for the condemnation of the particular style of construction, whereas the fault would be chargeable entirely to the lack of proper supervision of the work and the carelessness in which the details had been carried out. We are rapidly developing our building operations into a condition of exact science. When we take the same care with our protecting envelope of terra-cotta that we do with the steel skeleton itself, and are equally rigid in inspection, tests, and supervision, the chances of failure to fulfil all the conditions of fire-proofing will be greatly lessened.

THE LONDON FIRE.

FIRE-PROOF construction can be fairly claimed as an American development. We say this without any forgetfulness of the very valuable work which has been done in France and Germany, especially in the former country, where a species of fire-proofing, which has answered a certain purpose, has been in constant use for indefinite generations. The fire-proofing which meets the requirements of French construction would not, however, answer for us, and it surely does not operate in France to prevent pretty disastrous results at times. We doubt if any modern fire-proof buildings of this country have ever passed through a more disastrous conflagration than that which destroyed the large Magazins du Printemps, in Paris, a number of years ago, a structure which, according to French standards, was strictly fire-proof, was certainly planned better than the Pittsburgh buildings to resist fire, but which was totally wrecked, far less of its construction surviving the fire than was the case in the Pittsburgh fire. The fact that there are so comparatively few fires in France is very largely due to the methods of construction, which, though by no means fire-proof to the extent that we expect in our first-class buildings, are certainly much more capable of resisting a conflagration than the average structure in this country. Besides this, the French go about heating their buildings in a manner far different from our own, and one of our most fruitful sources of fires, defective flues, are by no means as dangerous there as they are with us. We have been obliged from necessity to develop our fire-proof constructions, because the majority of our buildings are so ill adapted for resistance, or to put it perhaps more truly, are so admirably planned to facilitate the spread of fire, and in order to secure any reliable protection we must carry our systems much further than is necessary abroad, and they are materially modified by contingencies which are not thought of elsewhere. It still remains a fact, however, that, *per se*, the foreign fire-proofing methods are, as compared with our own, unscientific and unreliable when tested in extreme cases. The recent conflagration in London affords an illustration of what has not been done abroad, and we notice by reports in technical journals that the official inquiry which has been undertaken to determine the causes of the fire and to investigate the possibilities for prevention for the future has developed the fact that in the opinion of the property owners the expense of making the reconstruction of this district of a thoroughly fire-proof character was such as, in their judgment, to be prohibitory, though the Goldsmiths' Company, which owns the land upon which the building stood, is perfectly willing to agree to a subdivision of the various structures in such a way as to check the spread of fire. We haven't a great deal of confidence in official investigations, especially when directed towards the premises of a wealthy and powerful corporation, and we are almost inclined to doubt whether such an investigation as will result from the London fire can be anything more than one-sided. That is to say, what is considered good fire-proofing practise abroad is not up to the standard which we should expect, and we can hardly expect the investigators to appreciate the necessities which are considered so paramount with us. We believe that the theory of fire-proofing as developed by us is scientifically perfect, our failures being due to lack of attention to detail, or to our not carrying our own systems to a logical and perfectly natural conclusion; whereas, the English systems of construction, if considered as means of preventing the occurrence of a large fire, are radically wrong, though many of the details of construction, such as stairways, arrangement of flues, subdivisions of premises, are better than are usually enforced in our large cities. London has had abundant occasion to learn her lessons in fire-proofing, but, large as that metropolis is, the fire losses there are so much less than the value of what is destroyed annually in our larger cities, that we can quite understand the reluctance of the Goldsmiths' Compar y to enter upon expensive and radical change in methods of construction. The Englishman is nothing if not conservative, and the fact that such systems have stood or given satisfaction for generations can easily be alleged as reason for reluctance in making the change.

Mortar and Concrete.

CHARACTERISTICS OF VARIOUS BRANDS OF AMERICAN NATURAL CEMENTS.— *Continued.*

BY CLIFFORD RICHARDSON.

Pennsylvania Magnesian Cements. Some magnesian cements are, or have been, made in Pennsylvania at Milroy, and a few other places, and classed as Rosendales. These have not proved of the highest quality. The hydraulic limestones either contain an excess of magnesia or a deficiency of silicates, and as with some others from the same State, free from magnesia, do not seem to be suited to the production of a high-grade natural cement. This part of the country is, in consequence, devoting itself more and more to the development of the Portland cement industry, for which its limestones, free from magnesia, seem entirely suitable.

Cements of the Middle West. The vast quantity of natural cement in use from the Gulf to the Lakes, and from Ohio to the Rocky Mountains, is supplied chiefly by brands made near Milwaukee, Wis., Louisville, Ky., and Utica, Ill., with smaller amounts made at Fort Scott, Kan., and Mankato, Minn., and a few other less important works. These cements are all magnesian, but vary very considerably in their composition, and consequently in their character.

Analyses of samples of these cements have already been given, but the physical tests recorded have been more or less incomplete. For the purpose of comparison among themselves, the results of tests made at Minneapolis, to which reference has been made already, will serve, although they are much lower than would be the case were the test pieces made to yield the best results with dry mortar and the proper compression.

AVERAGE RESULTS OF CEMENT TESTS FOR A SERIES OF YEARS FROM 1888 TO 1895.

Tensile Strain per Square Inch.

BRAND.	Neat. 24 hours.	7 days.	1 month.	2 months.	3 months.	4 months.	6 months.	1 year.	2 years.	3 years.	4 years.	5 years.
Louisville	131	142	202	271	327	353	368	416	443	460	384	493
Milwaukee	106	120	156	232	302	309	327	372	434	411	....	434
Mankato	109	119	218	238	259	273	280	319	336	317	335	392
Utica	53	153	246	236	257	268	242	259	282	320	281	322
Buffalo	119	172	260	294	305	336	290	346	...	....	....	....
Akron	91	151	216	308	317	373	364	369	410	...	...	....
1 CEMENT. 1 SAND.												
Louisville	70	85	118	150	178	213	257	271	311	329	285	294
Milwaukee	59	84	120	158	186	208	214	235	257	286	....	342
Mankato	49	67	140	163	179	171	182	195	186	183	....	....
Utica	21	100	160	164	182	192	156	196	212	292	240	315
Buffalo	60	73	128	191	209	222	212	167	.. .	....	....	....
Akron	65	78	145	203	219	220	213	202	160	....	....	...
1 CEMENT. 2 SAND.												
Louisville	37	50	71	95	110	129	144	161	173	172	165	155
Milwaukee	32	53	94	118	135	148	152	156	191	202	....	279
Mankato	31	43	98	116	120	125	126	153	128	179	..	201
Utica	19	96	117	111	122	128	121	131	172	213	179	228
Buffalo	29	39	73	92	115	110	103	97	...	...	...	....
Akron	38	47	96	155	152	173	149	115	110	....	...	....

Milwaukee Cement. This cement, as at present made, carries a large amount of magnesia, over 20 per cent., and has all the properties which are to be expected of a cement of that kind. The alumina and iron are not high, and a considerable part of the silicates are not decomposed and combined with the alkaline earths, owing to its being lightly burned. The result is that it gains strength more slowly than some other brands, but at a considerable age is quite equal to them in strength and toughness, and is often stronger in mortar and concrete, as can be seen by reference to the tests made at Minneapolis and from the examination of concrete in which it has been employed. The slow way in which it at times acquires strength necessitates care in using it during cold weather. It requires a medium quantity of water to make a mortar, and it will also be found to harden better in air than when immersed in water or allowed to remain in damp surroundings. It makes a smooth mortar, trowels well, and works easily in concrete. At its best no Western cement has given more satisfactory results. Vast quantities of work have been satisfactorily done with it, but, like all natural cements, there are variations in the quality, and it is reported to have been better some years ago than to-day. In general it is free from excessive expansion like the Western New York cements, but it resembles them in its composition very closely, and has now and then caused ridges in concrete.

The color of Milwaukee cement is a gray with a brownish tinge, more nearly like Portland cement than any of the Western brands except that made at Mankato.

Utica Cement. The natural cement made in La Salle County, Illinois, near Utica, is derived from a rock carrying a large amount of magnesia. To produce a satisfactory cement, it is now burned so that but a relatively small part of the silicates of the stone are decomposed and combined with lime, as compared with many other brands, and all the carbonic acid is not expelled. It has the usual characteristics of cements high in magnesia, and resembles the Western New York and Milwaukee cements in certain respects; but it is even more distinctively a magnesian cement than these, as it contains, in the specimen analyzed, but about 9 to 10 per cent. of combined silica, less than 5 per cent. of alumina and iron oxides, and as much as 17 per cent. of sand and silicates remaining undecomposed. On this account much of its hydraulic properties and strength must be attributed to the magnesia which is uncombined with silica, and in this respect it is probably unique in this country.

It is the lightest colored natural cement made, being a little more than off white, is very plastic, making a clay-like mortar with a medium amount of water, which has considerable covering powers, and trowels well. As made to-day, at its best, it has a high initial strength both neat and with sand, and continues to gain for long periods.

Louisville Cement. Louisville cement is put upon the market by a large number of different mills, and is made from rock obtained at various quarries, although all from the same formation. It is consequently a more or less variable article. As a whole, this cement has much less magnesia than either the Milwaukee or Utica brands, and in this respect is more like that made at Fort Scott, Kan., and Mankato, Minn. It is, like the latter, more thoroughly burned than those cements containing more magnesia, such as Utica cement, a small proportion of the silicates and silica only being left undecomposed. It requires more water to make a mortar than the lighter-burned cements, being quick setting as a rule, and it acquires its strength more rapidly. In time, however, no better results are obtained in sand mortar than with many other cements. Some of it is very quick. As a whole it requires to be used with care, and, as there are several different brands of Louisville cement, there may be as much variation in the supply as is the case with the Rosendales. Concrete constructed with Louisville cement has proved as satisfactory, in the opinion of those who have used it, as that made with any of the Western natural cements.

Fort Scott Cement. This cement is a pretty thoroughly burned product from a stone having about 12 per cent. of magnesia and not very rich in silicates to afford alumina. Being so well burned, it sets very fast if not previously hydrated. It varies in strength according to the care given in burning it, and high or low results may be obtained with different brands, in which respect it differs not more than many other kinds of cements. It eventually seems to give a strong mortar even when initially weak. It works smoothly, but requires more water in making a mortar than any of the natural cements, being quite peculiar in its action when first mixed, a preliminary reaction seeming to take place with the absorption of much of the water. Mortar made with it should be worked for some time and not made too dry.

Its color is characteristic, being quite a bright yellowish brown.

Mankato Cement. This cement is well burned, and similar to the Fort Scott and Louisville in composition, being, like them, somewhat deficient in alumina. It requires a medium amount of water, and gives good returns in strength soon after use. The mortar is not quite as plastic as that of the more magnesian brands. The writer has had no extended experience with this cement, but the Minneapolis tests, however, show that in ordinary sand mortar it continues to increase in strength for a long time, and compares favorably with the other Western natural cements, while in street work in that city it has been tried most severely and successfully by being exposed to travel for some time in concrete before being covered with an asphalt surface. Its color is similar to that of Milwaukee cement, a dull brownish gray.

Maryland Lime Cements. Of the same nature as the Round Top, which was selected as a type of these cements, are several other brands in use to a considerable extent in the markets of Washington, Baltimore, and the country adjacent to the places of manufacture, which are located along the Potomac in Western Maryland. Some recent tests of these cements have been published in the report of Mr. A. W. Dow, Inspector of Asphalt and Cements, of the Engineer Department of the District of Columbia, which are as follows: —

Brand.	Round Top.	Cumberland.	Cumberland and Potomac.	Cedar Cliff.
Tensile strength: —				
Neat, 1 day	81	169	146	88
7 days	203	218	204	185
2 parts quartz, 7 days .	122	156	188	85
1 month .	255	297	225	195
3 months	342	356	403	255
6 „	387	350	397	299
1 year .	515	438	436	364
Per cent. of water, neat	32.	32.	32.	32.
quartz	14.	15.	15.	15.

These lime cements set very quickly and acquire strength very rapidly, especially in sand mortar. It has been found, also, that they are not as much affected at early stages by the use of and excess of water as the magnesian cements. They have often a tendency to set too rapidly, heating strongly on mixing with water. This, however, it has been shown, can be avoided by proper sprinkling of the burned stone before grinding. Owing to the rapidity with which strength is acquired, these cements are peculiarly suited for arch work where it is convenient to draw centers soon after the completion of the work. In masonry work they are not as attractive, as the mortar often sets too quickly and does not trowel as well as that made with the magnesian cements. Especially in the form of neat mortar some of these lime cements become at times more or less brittle with age, owing to crystallization, but this is not as apparent in concrete, although with some brands the concrete has a greater relative tensile strength than toughness, fracturing more readily under a blow than concrete of magnesian cement.

Lime Cements of the Lehigh Valley. A cement is made along the Lehigh River, at Copley and other places, which is similar in some respects to the lime cements of the Potomac Valley. It is quite free from magnesia, sets with great rapidity, and is, as a rule, fiery. It gives a great initial strength, but in other respects cannot equal the Potomac cements. It is more often, since the establishment of the Portland cement industry in the same locality where it is made, mixed with a certain proportion of the second grade of this cement and sold as an "improved" natural. Much of it in its original form is very inferior. It is made from a rock which is now largely devoted to the manufacture of Portland cement when mixed with a purer limestone.

Other Cements. There are a number of other cements upon the market which are not as important commercially, and with which the writer is not personally acquainted. Their quality has not warranted, as a rule, their manufacture on a large scale, and they are employed only locally.

From the examination and comparison which has been made of the several kinds of natural cements which are made in the United States, it appears that there are such decided differences in their character that they may be classified as follows: —

I. Lime cement, containing only 2 or 3 per cent. of magnesia, 13 to 15 per cent. of oxides of iron and alumina, and about 20 per cent. of combined silica.

II. Lime cements with as little magnesia but with less silicates than class I., and consequently less satisfactory and more fiery.

III. Magnesian cements, with, at their best, about 15 per cent. of magnesia and the same amount of oxides of alumina and iron, with 15 to 20 per cent. of combined silica and considerable uncombined silicates, being not thoroughly burned.

IV. Magnesian cements with a large amount of magnesia, over 20 per cent., less alumina and iron, and less undecomposed silicates than in the preceding class.

V. Magnesian cements deficient in alumina and iron oxides and in combined silica, being lightly burned, but high in magnesia.

VI. Magnesian cements thoroughly burned, made from rock having a smaller amount of silicates than those of class IV., with only a medium per cent. of magnesia and little uncombined silicates.

Cements of the first class set and acquire strength rapidly, and increase in this direction for long periods. The final result is a more brittle mortar than is obtained with the magnesian brands.

The lime cements of the Potomac Valley are included in this class.

The second class has not as favorable a relation of silicates to lime, and consequently the cements are apt to be fiery and not as satisfactory. They are generally subjected to improvement by the addition of Portland cement, and are then used successfully. They are found in the Lehigh Valley.

The third class is represented by the best Rosendale brands, which set and acquire strength slowly, but which continue to develop it for long intervals and are eventually very strong and tough.

The fourth class includes cements like those of Western New York, which have been, while containing an unusually large amount of magnesia, burned so hard that little of the silicates have remained undecomposed and uncombined with the lime and magnesia, and in consequence are apt to expand a long time after use unless carefully hydrated before grinding.

The fifth class is one in which the cement is essentially a light-burned, highly magnesian material, in the preparation of which the heat has not been sufficiently high or prolonged to bring the greater portion of the silica into combination with lime and magnesia, in this respect being in contrast with the preceding class. The hydraulic properties and strength are due, therefore, largely to the magnesia and carbonates rather than to the silicates and aluminates. The cements of La Salle County, Illinois, represent it.

The last class contains the Louisville and Fort Scott cements, in which there is much less magnesia than in the two preceding, and less alumina and iron oxides than in the cements of the third class, although they are burnt so thoroughly that there is but a small per cent. of silicates and silica uncombined.

Notwithstanding all this variation in the character of the natural cements of the United States in practical use, they will all of them, when properly burned and carefully handled, give results which are only in the most exceptional cases failures. The writer is unaware that there has ever been an actual failure in masonry due to the natural cement used in its construction, although some important and extensive bridge work has been laid with it, and although it has frequently been used in the most careless way, being retempered after its original set or employed in the form of a very sloppy mortar. In concrete, inferior results are now and then obtained, especially in cold weather, or when the cement has been of some brand that has not been most carefully burned and put into the work. As a rule, with sufficient time, a natural cement mortar will acquire a satisfactory strength, even if originally weak, or unfavorably influenced by the conditions under which it has been used and the environment to which it is subjected.

The Masons' Department.

BRICK VENEER CONSTRUCTION.

BY FRED T. HODGSON.

THERE is a species of construction in which a facing of 4 ins. of brickwork is applied to the outside of a wooden frame, giving the simulation of a solid brick structure. This device is seldom met with in the East, but is quite common in the North and the West and in the Canadas; and though owing its origin to conditions of a time when framing lumber was cheap and bricks were expensive and not easily obtained, it has persisted in spite of its manifest sham, and has ascribed to it virtues which are hardly offset by its illogical character. Most people who desire to use this construction have the impression that a frame house veneered with bricks will cost considerably less than would a similar house if the walls were solid and of the usual thickness. In an experience of many years I have seldom been able to persuade a client to substitute a solid brick-walled house for the intended veneered sham; and yet the difference in the cost is in favor of the solid wall, if the veneering is figured as being properly done, and the woodwork for the skeleton built in a thorough and substantial manner.

The foundation walls required to sustain a veneered house must of necessity be as costly as those for a brick superstructure of corresponding dimensions; consequently there can be no saving in the foundation work. All bricks used in veneering must be good facing bricks of good quality, and, as the veneering is but 4 ins. in thickness, all the brickwork, excepting quoins, must be formed of stretchers, no "bats" being permitted; consequently the bricks will cost from 25 to 40 per cent. more than would bricks required for a solid wall, while the labor of laying a 4 in. brick course, including tying or bonding the bricks to the woodwork, is nearly double that of laying bricks in a solid wall. Then, the brick veneer must be laid from an outside scaffold, an expense not always necessary in the building of a solid wall; and iron, japanned, tarred, or galvanized ties or anchors to hold the bricks in position must be employed, at the rate of three to every hundred bricks laid in the wall, and these ties must be fastened to the woodwork on the frame and the projecting ends built in the brickwork. This is another expense which does not obtain with a solid wall.

As a rule, wooden window sills are used in veneered houses, the use of stone being almost prohibited because of the shallowness of the reveal. If stone sills are used, it is quite evident the cost of sills and setting them will exceed the cost of the same sills if used in a solid wall. The window and door frames required for a veneered house will cost just as much, and, in most cases, a trifle more than will corresponding frames for a solid wall, and the chances of a tighter connection to the wall are greatly in favor of the latter.

The opportunities for fashioning ornamental brickwork on a veneered building are so few and expensive that they are rarely embraced, unless the ornamentation is of the crudest and most primitive sort, conditions that do not obtain in solid brick walls. The arching over windows and doors in veneered work is of the flimsiest kind, and the least disturbance in the building is sure to make itself felt in these weak spots by cracking or displacing joints, as it is impossible to properly bond or tie the work at these points.

Inside the brick veneer there is erected a frame-studded skeleton. On the studding is nailed 1 in. pine or hemlock square-edged boards. Sometimes the stuff is dressed and matched, which adds to the cost; at other times it is nailed on the studding diagonally, with a view of giving strength to the structure. When this is done and the frame is boarded in both sides, the boards are so nailed that the joints cross each other, thus forming a double bracing. In the Northern, Northwestern, and Western States and the Canadas the outside boarding is covered with felt or building paper before the brickwork is commenced; and some builders also line up the inside of the house with suitable paper under the lathing. This, when carefully done, makes a warm wall, but it takes a great deal of time and care to paper around the openings and well in between the joists, and in contract work it is next to impossible to get workmen to make wind-tight joints with the paper at these points.

It is easy to see that the labor and materials used in the construction of the necessary frame ready to be veneered would cost very much more than the extra bricks and labor required to make the wall a solid one, and the walls of a veneered house, built as they ought to be, cost from 15 to 25 per cent. more than would good solid 9 in. walls.

Now, then, let us see some of the defects of a veneered house, and what is likely to result from these defects. Everybody knows that wood expands and contracts with every change of atmospheric conditions, thus causing a quiet but sure tearing away of the bonding connecting the two materials together, a condition that in the end must bring ruin to the building. It is almost impossible to fit bricks around window and door frames sufficiently tight to keep out wind when the wall is only 4 ins. thick. If, however, in veneering, care is taken and labor expended in having the joints between the frames and boarding properly covered with paper, well tacked on, it is possible to make the joints fairly tight, and they will remain so until the paper becomes broken, or falls away from the brick from decay or other causes. This expenditure of labor and time, however, adds materially to the cost of the veneering. That brick veneering is a sham goes without saying, for the experienced eye knows as soon as it looks at the building that it is veneered. A wall showing nothing but stretchers cannot deceive even the apprentice boy, and if, as I have known in several instances, an attempt is made to cheat the eye by making every sixth course of bricks appear as headers, by using "bats," a glance at the reveals and at the ornamental work will convince the experienced in a moment as to the true character of the walls.

After a careful consideration of the whole matter, and from facts gleaned from actual observation and experience, I have arrived at the conclusion that there is nothing to be gained, but considerable lost, both in economy and in efficiency, from building brick-veneered houses instead of houses with solid brick walls.

CRACKS IN PLASTERING.

HASTE is one of the drawbacks to good construction, and the results of hurry manifest themselves in nearly every department of building. The cracking of plaster cannot be blamed entirely to the shrinkage of wood or settlement of the foundations, for a certain kind of cracking in all lime mortar is due solely to haste in preparing the material. Lime mortar hardens by a species of absorption and a drying process quite distinct from the action of hydraulic cement. In order that the drying shall be uniform throughout the mass of lime mortar, it is essential not only that the lime be slaked for a long period before it is mixed with the sand, but also that the mortar should be mixed a considerable time before it is to be used, and that it be thoroughly manipulated, so that the particles of lime are evenly distributed, and the mixture perfectly homogeneous. Of course this is on the assumption that the lime is good to start with, which, unfortunately, is not always the case. Plasterers pay little attention to preparing mortar; this is usually left to the cheapest kind of labor, and if any one watches the average mechanic mixing mortar, it is evident that such a thing as a careful proportioning of materials received very little thought. We often find mortar which has stood for generations and is thoroughly hard, comparing very favorably with cement, but this is in the old buildings, and is a result of the care which was at times expended upon such work. It was formerly the custom to not only mix the mortar and sand together in the bed, but also to work it over carefully on a stone slab, thoroughly kneading it and mixing it before applying to the wall, securing thereby a perfect uniformity of composition which would insure a gradual drying of the plastering.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.—With the dawn of the new year comes the realization of our prophecies and dreams as to our great city, now Greater New York indeed, the second city in the world in population, and equaled by none in area. The event was ushered in amid scenes of great rejoicing, music, firing of cannon, and singing. The buildings surrounding City Hall Park were gaily decorated and brilliantly lighted. Of course there is still more or less confusion resulting from such a radical change of government, especially in the smaller boroughs, and it will be some time before everything will run smoothly.



DETAIL ON THE JEWELERS' EXCHANGE BUILDING, BOSTON.
Winslow & Wetherell, Architects.
Executed by the Perth Amboy Terra-Cotta Company.

Mr. Thomas J. Brady has been placed in charge of the Building Department, with two deputy commissioners. It is expected that some changes in the existing building laws will result, in which case they will be fully noted in these letters.

The Thirteenth Annual Exhibition of the Architectural League will be held in the Vanderbilt Gallery, Fine Arts Society Building, 215 West 57th Street, during February. The dates of the important events are as follows: —

Press View, Thursday, February 10, 10 A. M. to 4 P. M.

Annual Dinner, Thursday, February 10, 7.30 P. M.

League Reception, Friday, February 11, 8 P. M.

Public Exhibition from Saturday, February 12, to Saturday, March 5, inclusive. Hours, 9 A. M. to 6.30 P. M.; 8 P. M. to 10.30 P. M.; Sundays, 10 A. M. to 6 P. M.

Public Lectures, Wednesdays, February 16, 23, and March 2.

Smokers, Saturdays, February 19, 26, and March 5.

These exhibitions have been eminently successful in the past, and have been a tremendous factor towards the advancement of architectural taste and criticism. The League will collect and return, free of charge to exhibitors in Greater New York, Philadelphia, and Boston, all exhibits that have been entered.

At the monthly dinners of the League recently, the subjects discussed have been of vital interest, not only to architects, but to the general public. The subject at the January dinner was "Bridges," and the matter was thoroughly and intelligently dis-



TERRA-COTTA MANTEL, HOUSE AT PHILADELPHIA, PA.
Peabody & Stearns, Architects.
Terra-Cotta executed by the Standard Terra-Cotta Company.

cussed by the members. There was a strong sentiment in favor of more monumental bridges, enriched by sculpture, etc., than are now being built. With one notable exception, — the Brooklyn Bridge, — our bridges are not particularly ornamental structures.

At a previous dinner the subject was "Small Parks and Gymnasiums in the Crowded Districts." This subject was also intensely interesting, and was made more so by a score of clever plans prepared by different members and explained by them.

Among important competitions recently decided are: The Ellis Island immigration stations, for which the plans of Messrs. Boring & Tilton have been accepted. There will be five buildings, to be built of brick, stone, and iron, thoroughly fire-proof; cost, $570,000. Erasmus Hall High School, Brooklyn, a brick and stone building to cost $400,000, in which the successful architects were Messrs. Glover & Carrel. The College of the City of New York, Morningside Heights, for which the plans of Mr. George B. Post have been accepted.

These buildings are in the Collegiate Gothic style and will form a handsome group. The site could not be excelled. The cost will be about $1,000,000.

Plans are being prepared by Bruce Price for a large hotel to be built on Madison Avenue, corner of 42d Street,



TERRA-COTTA DETAIL, BAY WINDOW CURTAIN WALL, ATWOOD BUILDING, CHICAGO.
Executed by the Northwestern Terra-Cotta Company.



FIRST FLOOR PLAN, HOUSE AT PITTSBURGH.
Alden & Harlow, Architects.
Elevation shown on Plate 8.

McKim, Mead & White are preparing plans for the new Union Club House, to be erected on 54th Street and Fifth Avenue, at a cost of about $1,000,000.

CHICAGO.— Chicago had an epidemic of fires about Christmas week. One of the losses was the Quadrangle Club Building, the club headquarters of the professors of the University of Chicago. This building, previously referred to in THE BRICKBUILDER, was designed by the late C. B. Atwood. It was colonial in design, and was executed in rough, red sandmold brick, with large white mortar joints, and laid with Flemish bond. The cornice and broad white frieze were of wood, and the roof was of green slate. In rebuilding, the same design will be used, but with a wing for a necessary enlargement of the building. Architect Howard Shaw is working on the drawings.

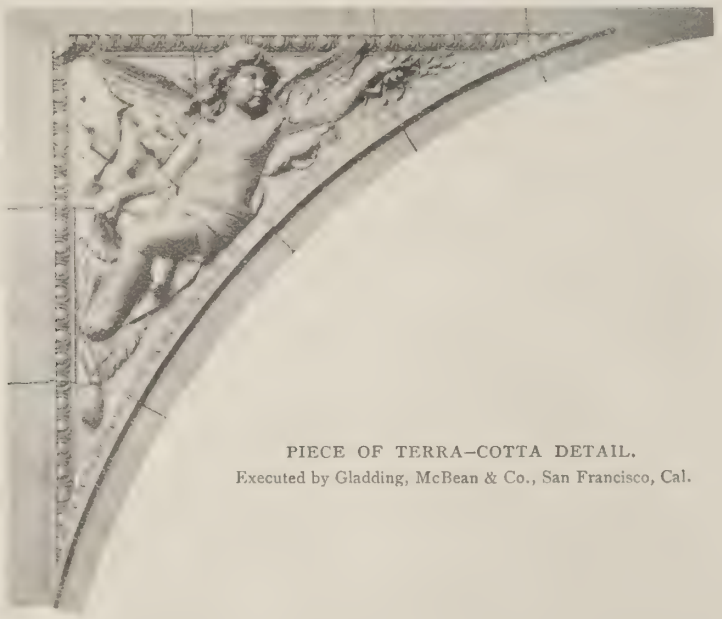
Another building burned was a gymnasium. This was connected with the academic department of the university, and was located in Morgan Park, a suburb.

The most serious fire loss was that of the "Coliseum," which was used for general exposition purposes, from a horse show to a bicycle race or a football game. This building, which was erected since the World's Fair, and near the site of same, gained notoriety from its collapse and almost total destruction during construction, when the great steel arches were, about half of them, in place and covered with an expanse of wood plank roof.

Building news reporters say that architects are smiling over projects, although the amount of work actually going ahead is not great. A certain amount of activity in real estate, however, gives some promise for the spring season. Mr. Phipps, of Pittsburgh, has bought ground on Monroe Street, and commissioned Jenney & Mundie to design an addition to the New York Life Building.

Studebaker Brothers are having S. S. Beman design a new building, and also add a tenth story to their Michigan Avenue structure.

Several transfers of property in the business center seem to hold promise of new buildings of a commercial character. A recent loan of so small an amount as $12,000 at 4¼ per cent. on property not in the central district is taken as an important example, showing the tendency toward lower interest rates, and possibly a corresponding increase in building operations. Curiously enough, it is said that the largest proportion of building the past year has occurred in the World's Fair district, which was thought to have been most seriously overbuilt.



PIECE OF TERRA-COTTA DETAIL.
Executed by Gladding, McBean & Co., San Francisco, Cal.



TERRA-COTTA PANEL, AMERICAN BAPTIST PUB. SOCIETY BUILDING, PHILADELPHIA, PA.
Frank Miles Day & Bro., Architects.
Executed by the Conkling, Armstrong Terra-Cotta Company.

The Union Mutual Life Insurance Company (D. G. Hamilton, resident director) has had contracts let for the erection, at Cottage Grove and 34th Streets, of thirty-two houses to cost about $228,000. They expect to build fifty more as soon as these are finished.

Shepley, Rutan & Coolidge are designing a group of buildings for the Chicago Orphan Asylum at Grand and 51st Street Boulevards. The exteriors will be colonial in style, with brick facing, terra-cotta trimmings, and slate roof.

The brick business in Chicago during the past year certainly has been far from satisfactory. Common brick have been delivered at buildings from $3.20 to $4.00 per thousand; since October, however, the price has risen to $6.00. The Chicago Hydraulic Brick Company say that 33 per cent. less pressed brick were sold during 1897 than in 1896, and that the price was 20 per cent. less.

GOES TO ST. LOUIS.

MR. HENRY E. MACK, for many years the general manager of the Eastern Hydraulic-Press Brick Company, has been called to St. Louis to assume the general management of the Hydraulic-Press Brick Company's immense business. Mr. Mack's achievements in developing the substantial success of the Eastern Hydraulic-Press Brick Company's business have long been recognized in the burnt-clay market of the East; it is therefore natural that the St. Louis Company, the parent of all other hydraulic companies in the country, should desire to have the direct association of his astute abilities in the management of its vast enterprises.

NEW CALENDARS AND CATALOGUES.

F. B. GILBRETH, 85 Water St., Boston, has again issued his novel and interesting calendar, which is intended as an advertisement for his system of waterproofing cellars. It is attractively gotten up, and made especially interesting to seaboard people, from the fact that the hours of tides serving are given for each day of the year.

WE are in receipt of a very handsome calendar for the coming year from A. Miller & Son, of Bradford, Pa., manufacturers and dealers in fine pressed brick. The illustration on the calendar is a half-tone reproduction of Wirkner's famous painting, "Diana and the Fawn."

SAMUEL H. FRENCH & CO., of Philadelphia, manufacturers of Peerless Mortar Colors, send their New Year's greetings in the form of a very attractive and useful calendar of the memorandum pad style, each leaf of which is divided into the seven days of the week, with liberal space opposite each date for memorandums.



BOSTON ATHLETIC CLUB BUILDING.
Sturgis & Cabot, Architects.



PLANTER'S HOTEL, ST. LOUIS.
I. S. Taylor, Architect.
Front brick furnished by the Hydraulic-Press Brick Company.

A VERY attractive calendar for 1898 has been issued by Jas. A. Davis & Co., 92 State Street, Boston, New England agents for the Alpha Portland Cement. Particular interest is attached to the illustration of this calendar, namely, two thoroughbred Boston bulldogs, from the fact that they were raised and are owned by Mr. Davis.

R. GUASTAVINO CO., fire-proof construction, Boston and New York, have issued the first of their bi-monthly calendars, the illustration of same being a three-part view of the roof over St. Anthony's Chapel, St. Matthew's Church, Washington, D. C.; Heins & LaFarge, architects. It is the intention of this company to send out a new calendar bi-monthly throughout the year, each having as a subject some illustration of their method of construction as employed on some prominent building.

F. W. SILKMAN, 231 Pearl Street, New York, importer of minerals, clays, chemicals, and colors, has sent us one of his very attractive hanging calendars, at the top of which is a striking picture in colors of two fine specimens of Gordon setters.

THE Correspondence School at Scranton, Pa., has issued a booklet the contents of which is a substantial endorsement of the architectural courses conducted by them, eighty students bearing testimony to the value of these courses.

WE are in receipt of a new catalogue just issued by the American Enameled Brick and Tile Company, illustrating and

describing their "standard colors, sizes, and special shapes of enameled and patent interlocking enameled wall tile."

A valuable feature of the catalogue is the practical description given of the details required for arch brick (enameled) in English, American, Roman, or Norman sizes. These details are accompanied by explanatory diagrams. Particular attention has also been given to the illustration of some ninety-five different shapes of molded brick which the company manufacture, and also to the variety of colors which they make. In order to facilitate selection in these there has been incorporated in the catalogue a colored chart showing fifteen different shades of brick.

The closing pages of the book are devoted to the description of a patent interlocking tile owned and manufactured exclusively by this company. These tiles are especially designed for the facing of walls, or for use in floors or ceilings. They are described as "an economizing brick or bonded tile for walls."

We can heartily recommend to our readers a perusal of this little volume as being a work which contains considerable information on enameled brick.



HOUSE AT ST. LOUIS.
Barnett, Haynes & Barnett, Architects.
Terra-Cotta executed by the Winkle Terra-Cotta Company. Front Brick furnished by the Hydraulic-Press Brick Company.

INTERESTING NEWS ITEMS.

CHARLES BACON, Boston, representative of Sayre & Fisher Company, has been awarded the contract for enameled brick for the new Southern Terminal Station, Boston.

ATLAS PORTLAND CEMENT is being used on foundations for new building on India Street, Boston; W. T. Sears, architect.

THE GRUEBY FAIENCE COMPANY is supplying the enameled tiles for the Subway Station, Haymarket Square, Boston.

THE patent Cleveland Steel Wall Ties made by the Cleveland Wire Spring Company, Cleveland, Ohio, have found a ready recognition among architects and builders throughout the country, excellence of manufacture and price giving them preference in the market; Samuel H. French & Co. are the handlers for Philadelphia, and Meeker, Carter & Booraem for New York.

THE DAGUS CLAY MANUFACTURING COMPANY has closed a contract to supply 170,000 brick for a new factory building at Straights, Pa.

CHARLES BACON, 3 Hamilton Place, Boston, has been appointed agent for the Celadon Roofing Tiles.

FISKE, HOMES & CO. have just completed the building of twenty-four brick and terra-cotta fireplaces for the Rauleigh Chambers on Mountford St., Boston.

R. GUASTAVINO COMPANY propose this present year to devote especial attention to fire-proof staircase construction, of which they have always done more or less.



DETAIL OF ENTRANCE, HOUSE AT ST. LOUIS.
Barnett, Haynes & Barnett, Architects.

THE DAGUS CLAY MANUFACTURING COMPANY, of Daguscahonda, Pa., are putting a fine line of Pompeian brick on the market in standard and Roman sizes.

THE RIDGWAY PRESS BRICK COMPANY, through their Pittsburgh agent, James R. Pitcairn, are furnishing the mottled gray Roman bricks for a new office building, and a residence at Pittsburgh.

WM. WIRT, CLARK & SONS, Baltimore, Md., agents for the Union Akron Cement, report that this cement is now being used by the Pennsylvania Railroad Company at Sunbury, Pa., and by the West Maryland Railroad Company at Hagerstown, Md.

THERE will be a large amount of architectural terra-cotta used in the new building for Jordan, Marsh & Co., Chauncy and Bedford Streets and Avon Place, Boston. This contract has been awarded to Waldo Brothers, agents for the Perth Amboy Terra-Cotta Company.



DETAIL OF WINDOW OVER ENTRANCE, HOUSE AT ST. LOUIS.
Barnett, Haynes & Barnett, Architects.

THE Navy Department has adopted the Mason Safety Tread for use in vessels, after the favorable report of an examining board, and requisitions have been made for the material for application to stair treads and other places on half a dozen battleships and cruisers.

ON the thirty-story Syndicate Building, Park Row, New York, the "Brooklyn Bridge Brand" Rosendale Cement is being used exclusively. Sixty-five thousand barrels of this cement were used on the New York Croton Aqueduct in 1897.

SAYRE & FISHER COMPANY front bricks will be used in the new residence for Mr. Fay on Commonwealth Avenue, Boston; J. T. Kelly, architect; also for the Jordan Building, Boston; Winslow & Wetherell, architects.

THE EXCELSIOR TERRA-COTTA COMPANY, through their Boston agent, Charles Bacon, will supply the architectural terra-cotta for the Spalding house at Pride's Crossing, Mass.; Little & Brown, architects; also for the Wood, Pollard & Co. Building, Boston; Shepley, Rutan & Coolidge, architects.

THE GRUEBY FAIENCE COMPANY, Boston, have executed a frieze, 125 ft. in length, of painted tiles in Delft blue, representing a panoramic landscape in Holland, for the grill room in the new addition to the Reynolds House, Boston; Arthur Vinal, architect.

THE RIDGWAY PRESS BRICK COMPANY, through O. D. Person, their New York agent, will supply 150,000 mottled and 4,000 ornamental brick for the new high school building at Newark, N. J. Also 120,000 stiff mud buff and gray bricks for the new school building at Newtown, L. I.

THE BERLIN IRON BRIDGE COMPANY is building the new 180 ft. drawbridge over the South Shrewsbury River, N. J.; also rebuilding the boiler house for the Riverside Worsted Mills at Providence, R. I. This building is to be made fire-proof, the walls are of brick, the roof being of tile with metal supports.



BOARD OF EDUCATION BUILDING, ST. LOUIS.
I. S. Taylor, Architect.
Front brick furnished by Hydraulic-Press Brick Company.



ST. LOUIS DAIRY COMPANY'S BUILDING.
W. Albert Swasey, Architect.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY will supply terra-cotta on the following new contracts: residence 38th and Ludlow Sts., Philadelphia, A. S. Wade, architect; stable at Caldwell, N. J., Jeans & Taylor, architects; and a new building at Philadelphia, for which H. E. Flower is the architect.

THE CELADON ROOFING TILE COMPANY, Charles T. Harris, Lessee, have closed contracts for roofing tile for two houses for Sanford P. Ross, Newark, N. J., H. E. Reeve, architect; 8 in. Conosera. Engine House, New York City Fire Department, Percy Griffin, architect; close shingle. Correspondence School at Scranton, W. Scott Collins, architect; 8 in. and 2 in. Conosera in combination.

W. T. BIRCH, Corcoran Building, Washington, D. C., writes as follows in regard to his use of Cabot's Creosote Shingle Stains on bricks: "I used them in two instances on old and discolored press-brick fronts, and with most gratifying

results. The brickwork now, after several months' exposure to sun and rain, looks quite as well as new."

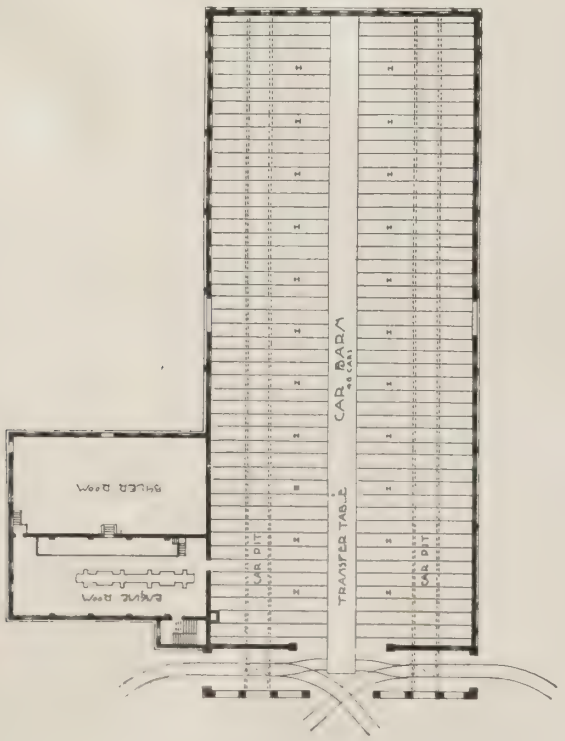
THE C. P. MERWIN BRICK COMPANY, Berlin, Conn., established in 1880, has withdrawn from the Central New England Brick Exchange Company. Theirs is one of the largest and best equipped brickmaking plants in New England, if not in the whole country. Their product is a superior quality of pallet face, building, sewer, paving, molded, and hollow brick. The plant is located on the main line of the N. Y., N. H. & H. R. R.

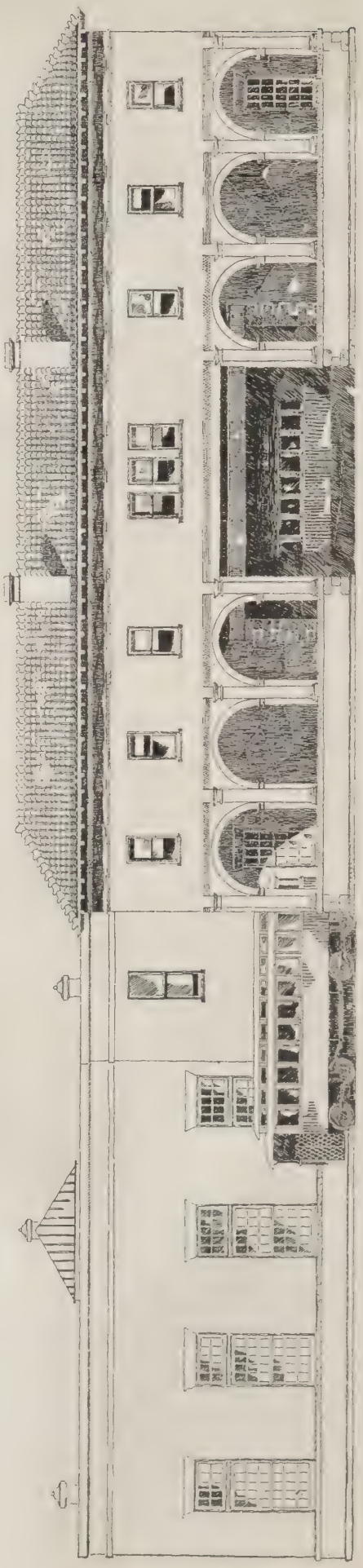
THE COLUMBUS BRICK AND TERRA-COTTA COMPANY are supplying their front brick on the following new contracts: Dark-gray Romans for three dwellings at Newark, N. J.; B. F. Hurd, architect; dark-buff standards for public school, No. 19, at Jersey City, N. J.; C. F. Long, architect; light-gray Romans for residence at Cincinnati, Ohio; M. H. Burton, architect; light-buff Romans for Journal Building, Dayton, Ohio; Williams & Andrews, architects; light-gray Standards and Romans for residence at Germantown, Pa.; George F. Pearson, architect.

OF new contracts the New Jersey Terra-Cotta Company has lately received: School, West New Brighton, Staten Island, N. Y.; John A. Hamilton, architect; school, No. 26, Jersey City, N. J.; H. & W. Newman, architects; grammar school, New Rochelle, N. Y.; George H. Pierce, architect.

This company is now working on the terra-cotta contracts for St. Patrick's Church, Whitinsville, Mass.; Chas. D. Maginnis, architect; apartment houses, 138th and 139th Streets and Brooks Avenue, New York City; Schickel & Ditmars, architects; residence, Seabright, N. J.; DeLemos & Cordes, architects; residence, Hillhouse Avenue, New Haven, Conn.; L. W. Robinson, architect.

A PROJECT is on foot to build a hotel, somewhat after the idea of the Mills hotel in New York, on the corner of Gainsboro and Parker Streets, Boston. The scheme is to erect a seven-story building, where comfortable quarters will be provided for young men at a moderate rate.





POWER HOUSE AND CAR BARN, ENGLEWOOD & CHICAGO STREET RAILWAY.
Reed & Stem, Architects, St. Paul, Minn.

THE CHICAGO TERRA-COTTA ROOFING AND SIDING TILE COMPANY, Chicago, report the following work under contract, for which their goods are to be used: Siding with French tile, of Malt House and Elevator, Superior Street and Center Avenue, Chicago; Beyer & Rautert, architects. French tile for store building, 63d Street and Monroe Avenue, Chicago; Cowles & Ohrenstein, architects. French tile for apartment building on Langley Avenue. Chicago; Healy & Gilbert, architects. French tile for two residences, 48th Street and St. Lawrence Avenue, Chicago; H. L. Newhouse, architect. French tile for Memorial Library, Athens, Pa., for Jesse Spalding. French tile for residence, Kewanee, Ill.; M. E. Bell, architect. French tile for Y. M. C. A. Building, at Galesburg, Ill. Spanish B tile for residence, Bloomington, Ill.; A. L. Pillsbury, architect. Inter-Ocean tile for building for J. W. Reid, London, Canada; Alf. Bodley, architect. Spanish tile for Christian Scientist Church, Kansas City, Mo.; Geo. Mathews, architect. French A tile for Soldiers' Widows' Home, Wilmington, Ill.; R. T. Newberry, architect. Spanish tile for store building of Chas. F. Young, Vinton, Ia.

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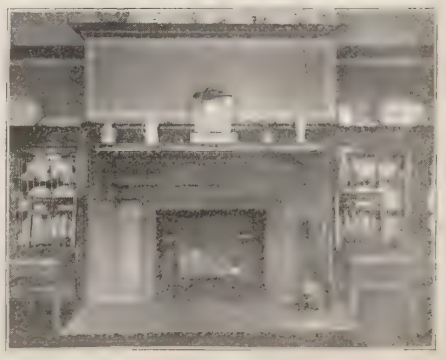
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INDEX TO ADVERTISEMENTS.

ADDRESS. PAGE

ARCHITECTURAL FAIENCE MANUFACTURERS. (See Clay Manufacturers' Agents.)
Atwood Faience Company, Hartford, Conn. ix
New York Agents, Pfotenhauer & Nesbit, Metropolitan Building, New York City.
The Grueby Faience Company, 164 Devonshire Street, Boston ix
Philadelphia Agent, O. W. Ketcham, 24 So. 7th St.
New York Agent, 287 Fourth Ave.
Chicago Agent, C. T. Harris & Co., Marquette Bldg.

ARCHITECTURAL INSTRUCTION.
Correspondence School of Architecture, Scranton, Pa. xxxvii

ARCHITECTURAL TERRA-COTTA MANUFACTURERS. (See Clay Manfrs.' Agents.)
American Terra-Cotta and Ceramic Company, Marquette Bldg., Chicago, Ill. . x
Brick, Terra-Cotta and Supply Co., Corning, N. Y. xvi
Burlington Architectural Terra-Cotta Co., Burlington, N. J. ii
Conkling-Armstrong Terra-Cotta Company, Builders' Exchange, Philadelphia . v
Excelsior Terra-Cotta Company, 105 East 22d St., New York City . . . iv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Fiske, Homes & Co., 164 Devonshire St., Boston vii
New York Office, Charities Building, 289 4th Ave. Philadelphia Office, 24 South 7th St.
Gladding, McBean & Co., San Francisco, Cal. ii
Indianapolis Terra-Cotta Co., Indianapolis, Ind. viii
New York Architectural Terra-Cotta Company, 38 Park Row, New York City . xxviii
New England Agents, Fiske, Homes & Co., 164 Devonshire St , Boston.
Philadelphia Office, 1341 Arch St.
New Jersey Terra-Cotta Company, 108 Fulton St., New York City . . . viii
Perth Amboy Terra-Cotta Company, New York Office, 160 Fifth Ave. . . vi
Boston Agents, Waldo Bros., 102 Milk St.
Standard Terra-Cotta Company, 287 Fourth Ave., New York City . . . vi
Boston Agents, O. W. Peterson & Co., John Hancock Building.
Philadelphia Agent, W. L. McPherson, Building Exchange.
The Northwestern Terra-Cotta Company, Room 1118, The Rookery, Chicago . x
White Brick and Terra-Cotta Company, 156 Fifth Ave., New York City . . viii
Winkle Terra-Cotta Co., Century Building, St. Louis, Mo. ix

BRICK MANUFACTURERS (Pressed and Ornamental). (See Clay Manfrs.' Agents.)
Brick, Terra-Cotta and Supply Co., Corning, N. Y. xvi
Brush & Schmidt, Office, 2 Builders' Exchange, Buffalo, N. Y. . . . xvii
Conkling-Armstrong Terra-Cotta Company, Builders' Exchange, Philadelphia . v
Columbus Brick and Terra-Cotta Company, Columbus, Ohio xi
Dagus Clay Man'f'g Co., Office, Ridgway, Pa.; Works, Daguscahonda, Pa. . xii
Day Brick Company, Belleville, Ill. ii
Fiske, Homes & Co., 164 Devonshire St., Boston vii
New York Office, 289 Fourth Ave.
Philadelphia Office, 24 So. 7th St.
Gladding, McBean & Co., San Francisco, Cal. ii
Harbison & Walker Co., The. Office, 22d and Railroad Sts., Pittsburg, Pa. . xiii
Hydraulic-Press Brick Co., The xlii
Home Office, Union Trust Building, St. Louis, Mo.
Merwin, C. P. Brick Co., Berlin, Conn. xi
New York and New Jersey Fire-proofing Company, 156 Fifth Ave., New York City. xxi
Ohio Mining and Manufacturing Co.: Office, 41 Wall St., N. Y.; Works, Shawnee, Ohio xiii
Oliphant, Pope & Co., Trenton, N. J. ii
Pennsylvania Buff Brick and Tile Co., Prudential Building, Newark, N. J. . xvi
Pennsylvania Enameled Brick Company, Townsend Building, New York City . xiv
Philadelphia Agent, O. W. Ketcham, Builders' Exchange.
Perth Amboy Terra-Cotta Company, New York Office, 160 Fifth Ave. . . vi
Boston Agents, Waldo Bros., 88 Water Street.
Philadelphia Office, 1044 Drexel Building.
Philadelphia and Boston Face Brick Co., 4 Liberty Sq., Boston 23
Powhatan Clay Manufacturing Company, Richmond, Va. iii
Ralston Brick Co., Ralston, Lycoming Co , Pa. ii
Raritan Hollow and Porous Brick Co., 874 Broadway, New York City . . xvi
Ridgway Press-Brick Co., Ridgway, Pa. xii
New England Agents, G. R. Twichell & Co., 19 Federal St., Boston.
New York Agent, O. D. Person, 160 Fifth Ave.
Sayre & Fisher Co., Jas. R. Sayre, Jr., & Co., Agents, 207 Broadway, New York xv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Tiffany Enameled Brick Company, New Marquette Building, Chicago . . xiv
White Brick and Terra-Cotta Company, 156 Fifth Ave., New York City . . viii
Williamsport Brick Co., Williamsport, Pa. xvii

BRICK MANUFACTURERS (Enameled). (See Clay Manufacturers' Agents.)
American Enameled Brick and Tile Co., 14 East 23d St., New York. xiv
American Terra-Cotta and Ceramic Company, Marquette Bldg., Chicago, Ill. . x
Atwood Faience Company, Hartford, Conn. ix
Fiske, Homes & Co., 164 Devonshire St., Boston vii
New York Office, 289 Fourth Ave. Philadelphia Office, 24 So. 7th St.
Grueby Faience Co., 164 Devonshire St., Boston ix
Hydraulic Press Brick Co., The xlii
Home Office, Union Trust Building, St. Louis, Mo.
Pennsylvania Enameled Brick Company, Townsend Building, New York City . xiv
Raritan Hollow and Porous Brick Co., 874 Broadway, New York City . . xvi
Sayre & Fisher Co., Jas. R. Sayre, Jr., & Co., Agents, 207 Broadway, New York xv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Tiffany Enameled Brick Company, New Marquette Building, Chicago . . xiv

BRICK PRESERVATIVE AND WATER-PROOFING.
Cabot, Samuel, 70 Kilby St., Boston xxxvi
Gabriel & Schall, 205 Pearl St., New York xxxii

BRIDGE AND BUILDING, IRON WORKERS.
Berlin Iron Bridge Co., Berlin, Conn. xxxvii

CEMENTS.
Alpha Cement Company, General Agents, Wm. J. Donaldson & Co., Bourse Building, Philadelphia xxxi
New England Agents, James A. Davis & Co., 92 State St., Boston.
Alsen's Portland Cement, 143 Liberty St., New York City xxxi
Berry & Ferguson, 102 State St., Boston xxxiii
Commercial Wood and Cement Company, Girard Building, Philadelphia, Pa. . xxxii
New York Office, 150 Fifth Avenue.
Cummings Cement Co., Ellicott Square Bldg., Buffalo, N. Y. xxxi
French, Samuel H., & Co., York Avenue, Philadelphia. Pa. xxxii
Gabriel & Schall, 205 Pearl St., New York xxxii
Lawrence Cement Company, No. 1 Broadway, New York City xxxii
Lesley & Trinkle, 22 and 24 So. 15th St., Philadelphia xxxii
Manhattan Concrete Co., 156 Fifth Ave., New York xxxiii

ADDRESS. PAGE

CEMENTS.—*Continued.*
New York & Rosendale Cement Company, 280 Broadway, New York City . xxxii
New England Agents, I. W. Pinkham & Co., 188 Devonshire St., Boston.
James C. Goff, 31-49 Point St., Providence, R. I.
J. S. Noble, 67-69 Lyman St., Springfield, Mass.
Lord Bros. & Co., Portland, Me.
Thiele, E., 78 William St., New York City xxxi
Union Akron Cement Company, 141 Erie St., Buffalo, N. Y. xxxi
Waldo Brothers, 102 Milk St., Boston xix

CLAY MANUFACTURERS' AGENTS. Brick (Front Enameled and Ornamental), Terra-Cotta, Architectural Faience, Fire-proofing, and Roofing Tiles.
Black, John H., 33 Erie Co. Savings Bk. Bldg., Buffalo, N. Y. xx
Fuller, H. E., & Co., Equitable Bldg., Boston xvi
Ketcham, O. W., Builders' Exchange, Philadelphia iii
Lippincott, E. P., & Co., 24 Builders' Exchange, Baltimore, Md., and 808 F St., N. W., Washington, D. C. xvii
Mayland, H. F., 287 Fourth Ave.. New York City iii
Meeker, Carter, Booraem & Co., 14 E. 23d St., New York City . . . xviii
Peterson, O. W., & Co., John Hancock Building, Boston xvii
Twichell, G. R. & Co., 166 Devonshire St., Boston ii
Waldo Brothers, 102 Milk St., Boston xix
Willard, C. E., 171 Devonshire St., Boston xix

CLAYWORKERS' CHEMICALS AND MINERALS.
F. W. Silkman, 231 Pearl St., New York xxvi

CLAYWORKING MACHINERY.
American Clay Working Machinery Co., Bucyrus, Ohio xl
Chambers Bros. Company, Philadelphia, Pa. xl
Chisholm, Boyd & White Company, 57th and Wallace Sts., Chicago . . xl
Eastern Machinery Co., New Haven, Conn. xli
Simpson Brick Press Co., 415 Chamber of Commerce, Chicago, Ill. . . . xli
The F. D. Cummer & Sons Co., Cleveland, Ohio xxxix
The Wallace Manufacturing Co., Frankfort, Ind. xxxix

ELEVATORS.
Eastern Machinery Co., New Haven, Conn. xli
Moore & Wyman, Elevator and Machine Works, Granite St., Boston . . xxxix

ENGINEERS AND CONTRACTORS.
Manhattan Concrete Co., 156 Fifth Ave., New York xxxiii

FIRE-PROOFING MATERIAL MANUFACTURERS. (See Clay Manufacturers' Agents.)
Boston Fire-proofing Co., 166 Devonshire Street, Boston xxii
Central Fireproofing Co., 874 Broadway, New York xx
Empire Fireproofing Co., 1301 Monadnock Block, Chicago xxiv
Fawcett Ventilated Fire-proof Building Co., Bourse Building, Philadelphia . xxiv
Boston Agent, James D. Lazell, 443 Tremont Bldg.
Fiske, Homes & Co., 164 Devonshire St., Boston vii
Gladding, McBean & Co., San Francisco, Cal. ii
Guastavino, R., 9 East 59th St., New York xxii
Boston Office, 444 Albany Street.
Meeker, Carter, Booraem & Co., 14 E. 23d St., New York City . . . xviii
Maurer, Henry, & Son, 420 E. 23d St., New York City xxxiii
New York & New Jersey Fire-proofing Company, 156 Fifth Ave., New York City xxi
Pioneer Fire-proof Construction Co., 1515 Marquette Building, Chicago . . xxi
Pittsburg Terra-Cotta Lumber Company, Carnegie Building, Pittsburg, Pa. . xx
New York Office, Townsend Building, Broadway and 25th Street.
Powhatan Clay Manufacturing Company, Richmond, Va. iii
Standard Fireproofing Co., 41 Cortlandt St., New York xxi

GRANITE.
Gilbreth Seam-Face Granite Co., 85 Water St., Boston xxxiv

MAIL CHUTES.
Cutler Manufacturing Co., Rochester, N. Y. ii

MASONS' SUPPLIES.
Gilbreth Scaffold Co., 85 Water St., Boston xxxviii
Hamblin & Russell Manfg. Co., Worcester, Mass. xxxvi
Waldo Brothers, 102 Milk St., Boston xix

MORTAR COLORS.
Clinton Metallic Paint Company, Clinton, N. Y. xxxiii
French, Samuel H., & Co., Philadelphia, Pa. xxxii

MURESCO.
Moore, Benjamin & Co., Brooklyn, N. Y. xxxv

PRESERVATIVE COATINGS.
Smith, Edw., & Co., 45 Broadway, N. Y. 23

PLUMBING GOODS.
Randolph & Clowes, Waterbury, Conn. xxxv

ROOFING TILES MANUFACTURERS. (See Clay Manufacturers' Agents.)
Chicago Terra-Cotta Roofing and Siding Tile Co., 1122 Marquette Building, Chicago, Ill. xxvi
Harris, Charles T., lessee of The Celadon Terra-Cotta Co., Limited. . . xxvii
Main Office and Factory, Alfred, N. Y.
Chicago Office, Marquette Building.
New York Office, 1120 Presbyterian Building, New York City.

SAFETY TREAD.
The American Mason Safety Tread Co., 40 Water St., Boston xxxv

SNOW GUARDS.
Folsom Patent Snow Guard, 178 Devonshire St., Boston, Mass. . . . xxxvii
Hamblin & Russell Mfg. Co., Worcester, Mass. xxxvi

VENTILATORS.
Pancoast Ventilator Co., The. 316 Bourse Building, Philadelphia, Pa. . . xxxvi

WALL TIES.
The Cleveland Pat. Steel Wall Ties. Wason, Hamilton, and Dart Sts., Cleveland, Ohio xxxvi
Hamblin & Russell Manfg. Co., Worcester, Mass. xxxvi

WINDOW PULLEYS.
Queen Sash Balance Co., 150 Nassau St., New York xxxvi
The Shull Overhead Window Pulley, 178 Devonshire St., Boston. . . . xxxvii
100 Park Place, New York.

CHARLES T. HARRIS, *President.*
HENRY S. HARRIS, *Vice-President.*

INCORPORATED 1888.

WILLIAM R. CLARKE, *Secy. and Treas.*
ALVORD B. CLARKE, *Superintendent.*

The Celadon Terra-Cotta Co., Ltd.

CHARLES T. HARRIS, LESSEE.

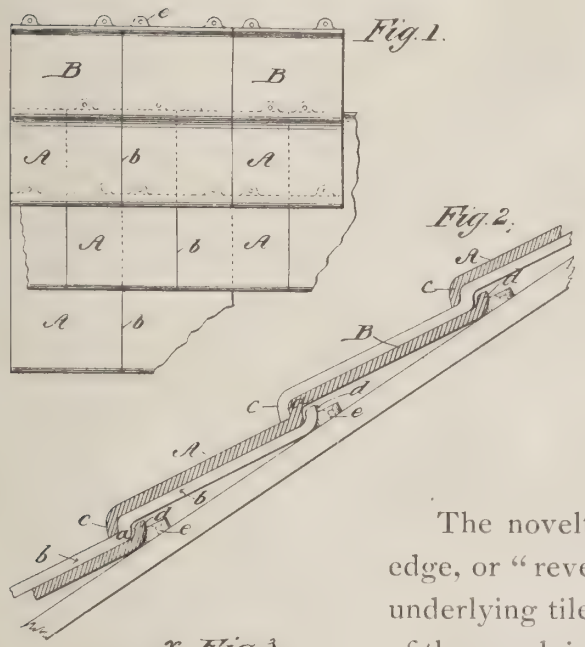
.....Manufacturers of **Artistic Roofing Tiles.**

(Under Babcock Patents.)

NEW YORK OFFICE,
1123 Presbyterian Building,
156 Fifth Avenue.

ALFRED, N. Y.

CHICAGO OFFICE,
1001 Marquette Building,
204 Dearborn Street.



ON this page are shown Improvements in Roofing and Sheathing Tiles, of which the following is a specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a plan view of several tiles embodying the invention, arranged as they would lie upon a roof; Fig. 2, a vertical section taken on the line *x x*, Fig. 3, showing the tiles combined as in Fig. 1; and Fig. 3, a face view of a single tile, represented on an enlarged scale.

This improvement relates to clay or other tiles which are rectangular, or nearly so, in form, and abut at the sides in continuous rows lengthwise of the roof, being laid so as to "break" joints (shingle fashion) between consecutive rows.

The novelty consists in applying to this character of tile a downturned flange at its lower edge, or "reveal," giving a high relief to the same, and conforming the adjacent portion of the underlying tile with an upward bend or wave near its middle, which fits the downturned flange of the overlying tile so as to bring every part of the adjacent lapping surfaces closely together and effect the sealing of the abutting joints. An upturned flange is also provided to the uppermost edge of the tile, which flange interlocks with and beneath the adjacent upward bend or wave of the overlying tiles to prevent penetration of wind, rain, or dust between the part of the abutting joints that intersect said upward bend or wave of the overlying tiles.

The upper and lower portions A and B of the tile lie in distinct planes, joined by the offset or wave portion *a*. When the tiles are combined a double thickness of the material is formed throughout the roof, thereby closing the space beneath the abutting joints between the plain edges *b* at every part.

c c represent the downward flanges, terminating the exposed surfaces of the tiles, and *d* the upward flanges, terminating the underlying ends thereof.

The tiles may be lightened by cutting off portions of the upper half, as shown in dotted lines in Fig. 3, without interfering with their tightness.

The tiles may be secured to the substructure by any suitable mode or device. We have illustrated that of providing ears *e*, having perforations for the reception of nails.

By the interlocking of the flanges at the ends with the wave in the center, the tiles are rendered mutually supporting, so that should the fastening of any one become loosened it cannot fall and endanger persons below, as is the case with common shingle-tile and slate.

The accompanying cut of the LITHGOW MEMORIAL LIBRARY, AUGUSTA, ME., shows a building covered with these tiles.



LITHGOW MEMORIAL LIBRARY,
AUGUSTA, ME.



THE ASTORIA HOTEL, FIFTH AVENUE AND THIRTY-FOURTH STREET, NEW YORK CITY. H. J. HARDENBERGH, ARCHITECT.

Attention is called to the fact that some 61,000 cu. ft. of terra-cotta are used on this building and the Astor Court Building, seen in the distance. This includes the work made for the interior, on the ground and first floors. The total weight was about 2,200 tons, which is equal to 600 truck loads of 7,333 lbs. each.

ARCHITECTURAL TERRA-COTTA EXECUTED BY

The New York Architectural Terra-Cotta Company,

38 PARK ROW, NEW YORK CITY.

PHILADELPHIA. BOSTON.

VOLVME VII FEB. 1898 No. 2

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

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SMALL OPPORTUNITIES.

A CRITICISM, which is often quoted against the species of architectural training which is afforded by the Ecole des Beaux Arts in Paris, is that the problems treated therein are not practical ones; that the large, monumental style of design which finds favor with the school traditions is not of the sort by which we Americans can most truly profit, and that a young man who follows such a course of training views architecture through the wrong end of the opera glass. Such a criticism springs from a misconception of architecture as a fine art. The difference in the results of American and foreign architecture, and the causes of much of the deficiencies which we cannot but admit and regret in our national civic architecture are due very largely to the bias which we seem to have inherited from our English artistic parentage, of viewing architecture as a development from the individual house to the palace, rather than considering it to be the art of the palace which may be applied to the small house. In other words, architecture, when at its best, is a development of wealth and power; and if we have artistic homes, if our small buildings are successful in an artistic sense, it is because of the opportunities which wealth and power have placed within the reach of the profession, whereby opportunities for study in the large have been afforded. It is only in proportion as we disregard expense, *per se*, disregard the so-called practical conditions, that we are able to produce work which will stand in the artistic sense. We would not be understood by this as saying that practical conditions should not be considered at all; but viewing architecture as a fine art, which it undoubtedly can be and is in the hands of our best practitioners, the practical elements should be considered only in as far as they are essential to a proper artistic treatment of the whole, for, however practicable a building may be, if it is not artistic it is not architecture.

Now, every one does not have the opportunity to build palaces, in this country especially, and most of us have to content ourselves with what crumbs of artistic possibilities may fall to our table. Such a limitation need not imply, however, a lack of appreciation of possibilities for the larger development, if we will bear in mind that art is more than steel construction or foundations, and when we are obliged to delve in the humbler lines of design, will keep our minds ready and trained for the study of the larger solutions. We believe that growth is well-nigh impossible for an architect whose practise is limited to ordinary buildings, if he confines his attention simply to the structures which come to his hand. He must reach out beyond, and undertake in moments of leisure study to grapple with the great problems, to test his strength on the broader type, otherwise even his small buildings will deteriorate in quality, and he will find it hard to keep what power he has. No one can afford to know it all nowadays; we must keep studying, keep reaching out, searching for the larger opportunities. A story is told of an architect in Belgium who for twenty years, without any encouragement, spent all his spare time in seriously studying the plans and possible designs for a monumental structure; and when after years of study he was elected, a man almost unknown, to design the new law courts in Brussels, he was able to bring out his previous studies and show how for twenty years he had been elaborating the very scheme The result of his continued thought shows in the building, which is unique in many ways, and ranks among the best of its kind. Now, that is what we need to do if we would not let our weapons get rusty. The throttling effects of limited opportunities is a factor which every architect appreciates who has the artistic success of his profession at heart, and it is a matter of necessity in these days, when the manifestations of art are spreading so fast, and its possibilities are so much enlarged, that we should be ready when the time comes to meet the higher demand.

But even if it never comes, even if one all his life is to be bound down to the petty, small problems, the spirit which will prompt him to study the large opportunities will manifest itself in the small ones, and his work will be so much the better for it. Architecture is preeminently the art which depends upon size for its effect, and yet the large feeling which is manifest in such works as the Temple of Karnac or the south front of the Louvre finds its expression sometimes in even so simple a thing as a library interior in a five thousand dollar house or the treatment of a brick gable. Limited opportunities belittle if treated in a petty spirit, but when viewed with a larger scope, when the opera glass is turned the other way and we approach our architecture from the monumental side, the small opportunities can be magnified into great successes.

WE resume in this number the republication of Street's "Brick and Marble Architecture in Italy," which was interrupted two years ago on account of the pressure of other matter; and we are sure our readers will be glad that the completion of our republication can now be continued without further interruption. The book is of value not only because it still remains, perhaps, the best account in English of the architecture of which it treats, but it has the farther interest, in the insight it gives into the point of view of one of

the foremost of the architects who led the Gothic revival in England in the middle of the century. Traveling in Italy was in those days by no means so common, even among architects, as it has since become, and these notes of journeyings in Italy have an added zest if one reads them remembering that they were written as an account of explorations in comparatively unknown regions; for the architecture of which it treats had hitherto been overlooked by most, even, of those who traveled in Italy.

We shall, as before, illustrate the subjects in each successive instalment of the republication, by reproductions from photographs. This will give us the opportunity of offering to our readers a large amount of material from the best of Italy's brick and marble architecture. We shall illustrate especially the brickwork on the buildings in which brick and marble is combined; but occasionally, as in the present number, which treats of St. Mark's at Venice, our text will lead us to show subjects in which brickwork does not appear, though at St. Mark's the structure is of brick, and, indeed, originally the brickwork was displayed, and was not encased with marble as it came to be soon after its construction.

THE American Architect and Building News Company has published a work of considerable interest in the shape of a series of plates illustrating the Georgian or colonial period of American architecture, reproduced from drawings by many of our best-known illustrators, including such names as Gregg, Wallis, Bragdon, and many others. The first part includes thirty-three well-selected plates, the subjects of which, while not altogether unfamiliar to the architectural public, are such as to make the collection of very tangible value. Part II., which is now in course of preparation, is to contain not less than forty-eight plates of measured drawings, many of which have never before been published, together with a number of gelatine prints of details from domestic and public buildings in the New England, Middle, and Southern States. The work is issued at prices of $4.00 and $6.00 for the respective parts. It forms a welcome addition to the available illustrative publications upon the subject.

The Georgian Period: being measured drawings of colonial work in the United States. Boston: American Architect and Building News Company.

PERSONAL AND CLUB NEWS.

GEORGE H. INGRAHAM, architect, Boston, has taken offices in the Tremont Building.

H. C. RUTHERFORD, architect, Scranton, Pa., has removed his offices to the Burr Building. Samples and catalogues desired.

HENRY LOOMIS CURTIS has opened an office for the practise of architecture at 1120 Harrison Building, Philadelphia.

WESTLAKE & HOWARD have opened an office for the practise of architecture in the Johnson Building, Muncie, Ind. Samples and catalogues desired.

MR. GEORGE W. GOUINLOCK, architect, has removed his offices from 53 King Street, East, to the seventh floor, Temple Building, corner of Bay and Richmond Streets, Toronto.

LONG & KEES, architects, Minneapolis, Minn., have dissolved partnership. Mr. F. B. Long has formed a copartnership with his son, Louis L. Long, under the firm name of F. B. Long & L. L. Long, with offices in the Kasota Building.

SHANK & WETHERELL, architects, Observatory Building, Peoria, Ill., have dissolved partnership, Mr. Shank retaining the old office, and Mr. Wetherell associating himself with Richardson & Hotchkiss, Dime Savings Bank Building, under the firm name of Richardson, Wetherell & Hotchkiss.

MR. CHARLES S. FROST, formerly at 604 Pullman Building, Chicago, and Mr. Alfred H. Granger, of Cleveland, Ohio, have formed a partnership under the firm name of Frost & Granger, architects, and after Feb. 1, 1898, will be located at 806 The Temple, southwest corner of La Salle and Monroe Streets, Chicago.

A REGULAR meeting of the T Square Club was held on Wednesday evening, January 19, the subject for competition being, "A Club House for a Country Club."

Mr. Walter Cope led the criticism on the ten designs submitted.

First mention was awarded to Mr. A. M. Githens; second mention, to Mr. W. P. Trout; and third mention, to Mr. George G. Bassett.

CHICAGO ARCHITECTURAL CLUB happenings of recent date are as follows: —

Mr. P. B. Wight, secretary of the Illinois Board of Examiners for Architects, delivered a lecture at the club rooms, Monday evening, January 24, on the new law governing the practise of architecture in the State of Illinois, and its benefits.

On Monday evening, February 7, the members of the club were requested to come to the club rooms prepared with pencils, sketch blocks, and bright ideas, to participate in a competition for the design of a building, the governing conditions of which were announced on that evening.

A time limit of one half hour was set for the preparation of sketches, and a general criticism and discussion of the problem followed.

The second and third exhibitions of Projēt Drawings took place on the evenings of January 31 and February 14 respectively. Different squads of members dispensed the hospitality of the club on each occasion.

ILLUSTRATED ADVERTISEMENTS.

ON page vii, in the advertisement of Fiske, Homes & Co., number eight of the series of brick and terra-cotta fireplace mantels is shown.

A new residence at Pittsburgh, Pa., is illustrated in the advertisement of Harbison & Walker Company, on page xiii.

Number four of the descriptive series of the roofing tiles made



TYMPANUM IN CENTRAL DORMER OF A SIXTEEN-STORY HOTEL ON 33D STREET, NEW YORK.
H. J. Hardenbergh, Architect.
Executed by the New York Architectural Terra-Cotta Company.

by the Celadon Terra-Cotta Company, Charles T. Harris, lessee, is given in the company's advertisement, page xxvii.

Examples of bond, showing blocks of the Gilbreth Seam-Face Granite laid up in two styles of bond, is illustrated in the company's advertisement, page xxxiv.

THE LEAGUE EXHIBITION.

THE Annual Exhibition of the Architectural League of New York has come to be one of the artistic features of the year, both on account of the manner in which it has been managed and for what it represents. It is true that the public, properly so styled, gives the exhibition but scanty support, and even the profession in New York does not put itself in evidence either by attendance or by a specially manifested interest, but that it has a very positive influence and a recognized value can hardly be questioned by any one who has had the good fortune to attend during successive years. In the present exhibition there are fewer small subjects than last year, less merely pretty architectural picture making, but there seems to be a more evident sympathy for monumental architecture, and more and better attempts than in any previous year to large and broad treatment.

A very fascinating set of drawings, and in some respects one of the most interesting in the exhibition, is that exhibited by Cope & Stewardson, showing the building for the Pennsylvania Institution for the Instruction of the Blind, a structure recalling the North Italian work, with a touch of the Southern Californian Mission style, with red tile roofs, and walls presumably stuccoed, forming a bright, sunny combination, with excellent proportion and a few carefully studied details, a most pleasing group, and one which would indicate a unique and very successful building. The drawings themselves were extremely clever of their kind.



Another most excellent example of brickwork is shown by the design for the new Court House of Livingston County, at Geneseo, N. Y. The building itself is shown as a colonial combination of Flemish bonded brick, with stone quoins, and a center treatment consisting of a high two-storied colonnade with pediment presumably of wood, a design which, handled with less nicety of proportion and sense of fitness, might easily become commonplace, but which is a charming bit of composition, and is ably presented by the drawing. The perspective is in black and white, and shows the building set in a winter landscape, with a few hunters on horseback in the foreground, the coats of hunters a bright scarlet, as if at the last moment Mr. Bragdon, after having made the whole drawing in pen and ink, had felt the need of a sharp note in the foreground. What makes the drawing all the more interesting is that instead of using hard India ink, the draughtsman has employed a writing ink, just a slight purplish-gray black, which softens the effect wonderfully.

Mr. R. Clipston Sturgis contributes a sketch for a country house, of brick and stone in a semi-Tudor style, with simple quiet treatment of lawn and terraces in front. This house we hope to illustrate in a later issue. Another very pleasing sketch is contributed by Mr. Frank Allison Hays, showing an arrangement of brick gable end with a picturesque group of chimneys, forming addition to an existing house.

Cope & Stewardson also exhibit a design for house for J. S. Morgan, at Princeton, an example of the kind of work the clever Philadelphians have been doing of late in combinations of brick and stone. Charles I. Berg has an interesting drawing, a block of five city houses treated like one continuous eighteenth century palace, with marked end pavilions and Mansard roof, the face being carried out in red brick and white stone. The whole arrangement of the basement, the high principal story, and the grouping of the roofs is quite in the style of the French work.

Mr. E. P. Casey has a drawing for one of the city engine houses, presumably on an isolated plot, a design in red brick and white stone trimmings in the French style, which at present seems to be quite the fashion in New York. Tracy & Magonigle contribute several of Mr. Magonigle's very strong, simply treated water-color sketch designs, especially one for an inn at Bernardsville, N. J., a combination of half timbering, plaster gable work, a green roof, and a long, low-lying ell running off towards the stable, with a blank brick wall tied into the first story brickwork of the main structure; a remarkably brilliant drawing.

The drawing of a house at Bar Harbor, by John Calvin Stevens, is a surprise. It represents a brick-gabled, quiet Tudor style of house, with projecting wings, a pedimented entrance, a broad terrace with balustrades across the front, with a line of high brick wall tying the house and stable together; a very comfortable composition, but so different from Mr. Stevens's usual highly picturesque treatment that we looked twice at the catalogue to make sure it was his. If this is a new manner with Mr. Stevens, he is surely to be congratulated.

A drawing which looks as if it were a page taken from some quiet, sleepy town of Holland is a design for the Wallabout Market Tower, Brooklyn, by W. B. Tubby, architect. The perspective

drawing is signed by Robert L. Adams. It shows a queer, quaint combination of gables, long, narrow slitted windows, a huge clock dial, and a picturesque chimney climbing up towards the top of a square, solid brick tower, with quite the flavor which is hanging around Haarlem and Delft. We wish there were more such.

A building which has been previously illustrated in this journal is shown at the League Exhibition by a carefully rendered elevation. In the Crozier Building, Philadelphia, Mr. Frank Miles Day has been able to accomplish what is so often attempted — a design of a tall commercial building which is architectural from grade line to pinnacle, with a well-defined base, a simple shaft, and elaboration into a crowning capital. Whether all commercial considerations will tolerate in other instances a high-pitched roof is a question which does not affect the artistic qualities of this design. It is to be doubted, also, whether many property owners would be willing to sacrifice so much space in the ground story in the shape of heavy piers and arches to afford an adequate and proportional support for the upper stories; but certainly, taken as a whole, it is one of the most successful designs of its kind which we have seen. If we are rightly informed, it is entirely of brick and terra-cotta above the ground floor.

A lack in the exhibition is the absence of any decorative work in tiles or colored terra-cottas. We know there is plenty of this being done, and of a very high artistic quality, but somehow it does not seem to find its way into exhibitions. There are a few samples shown of underglaze on tiles, but they are too amateurish to count as serious work.

An exhibition of this sort is an architectural tonic. Not all that is exhibited is good, by any means, and we miss the work of many representative architects, but the value, as a whole, is quite appreciable, even if not precisely defined. Sometimes we feel the best good from such an effort comes beforehand, in the months of preparation, in anticipation, and in the species of mental restraint which the knowledge that we are going to exhibit will exert over one. Not that the drawings have the appearance, however, of being made especially for show, rather each year there is less of this and more indications that the drawings represent the manner in which architects are working out their ideas in architectural practise. One of the speakers at the League dinner made the witty remark that whenever he went to church he was convinced that an architect not only built the edifice, but must have planned that part of the service which declares he had left undone the things he ought to have done. The point would apply to any exhibition; still, the things which are done and done so well, and which are growing in number every year, are abundant testimony to at least the direction of growth which make this exhibition all that it is.

THE T SQUARE CLUB EXHIBITION.

WE have received the very successful illustrated catalogue of the architectural exhibition of the T-Square Club, Philadelphia. It is interesting to compare this number with those of some of the first years in which the club held its exhibitions and note how marked has been its progress. Indeed, we question whether any other one publication could more fittingly show the change in attitude of the architect than these illustrated catalogues. The club this year has evidently made considerable effort to interest foreign contributors. There are several English drawings, notably R. Norman Shaw's wonderfully clever drawing of the building for the Alliance Assurance Company, London; also some of Ernest George's equally charming interiors. The comparison which this catalogue affords between the work of our foreign brethren and that of some of the trained coterie who have given the T-Square Club its reputation is decidedly interesting and instructive, and while the English work is on slightly different lines, the result is, from our standpoint, by no means to the detriment of our home talent. The catalogue contains an unusual quantity of most excellent material.

THE Managing Committee of the John Stewardson Memorial Scholarship in Architecture announces by authority of the Trustees of the University of Pennsylvania, who act as trustees of the Memorial Fund, a competition for a scholarship of the value of one thousand dollars, the holder of which is to spend one year in travel and in the study of architecture in Europe under the direction of the committee.

Candidates must be under thirty years of age, and must have studied or practised architecture in the State of Pennsylvania for the period of at least one year immediately preceding the first day of March, 1898. Programs of the competition may be had by addressing Mr. Frank Miles Day, Secretary of the Managing Committee, 925 Chestnut Street, Philadelphia.

TESTS OF THE CRUSHING STRENGTH OF BRICK PIERS.

BY PROF. CECIL B. SMITH.

THE following tests of the crushing strength of brick piers are interesting both as regards the absolute loads recorded, and also because, while with lime mortar brickwork the strength of the mortar determines the load which the pier can carry, this is not so where good Portland cement mortar is used. The tests show that the quality of the brick determines the pier strength, as the first and second brands of cement were rather superior to the third and fourth, as is shown by the tests of a cube of mortar from the same mixing; but the superior strength of the pressed brick became evident in spite of this.

Another interesting point always brought out by such tests is that the pier strength per square inch is considerably less than that of a single brick on its flat, but considerably more than cubes of mortar, *i. e.*, beds of mortar are far stronger than cubes, and single bricks than built walls.

The compressions recorded are very small, owing to the rigidity of the mortar, but piers laid in lime mortar give very much greater compressions per unit load.

TESTS OF BRICK PIERS.

McGILL UNIVERSITY LABORATORIES, MARCH, 1897.

Dimensions of Pier.	Mortar.	Brick.	Crushing Strength, lbs. per square inch.		Age.	Failure.		Compression per foot.		Strength of Mortar. 3 in. x 3 in. cube.
			At 1st Crack.	Maximum Load.		Initial.	Final.	400 lbs. per square inch.	800 lbs. per square inch.	
8.1 ins. x 8.1 ins. 11.6 ins. high. Joints, ⅓ in. thick.	1 Canadian Portland. 3 Sand.	Ordinary well-burnt Flat Brick.	822	1,234	3 Weeks.	In the Brick.	In the Brick.	.001 ft.	.0025 ft.	711
8.1 ins. x 8.1 ins. 11.6 ins. high. Joints, ⅓ in. thick.	1 German Portland. 3 Sand.	,,	990	1,230	,,	,,	,,	. . .	. . .	. . .
8.2 ins. x 8.3 ins. 10.5 ins. high. Joints, ½ in. thick.	1 English Portland. 3 Sand.	La Prairie pressed, Keyed on one side.	1 130	1,524	..	,,	,,	.0025 ft.	.004 ft.	. . .
8.4 ins. x 8 4 ins. 10.75 ins. high. Joints, ¼ in. thick.	1 Belgian Portland. 3 Sand.	,,	1,204	1,985	,,	,,	,,	.003 ft.	.0045 ft.	677

N. B.— The crushing strength of a brick similar to those in piers Nos. 1 and 2, laid on flat and bedded in plaster of Paris, was 1,400 lbs. per square inch for first crack, and 2,400 lbs. per square inch maximum load.

The American Schoolhouse. IV.

BY EDMUND M. WHEELWRIGHT.

IN the Hopedale and the Longfellow Grammar Schools we have an opportunity to compare the features and consequent differences of cost of two schools of the same type, built by the same architect, one in the country and the other in Boston, under the requirements of the building laws of 1892.

The Hopedale is a three-story building, with eight schoolrooms and an assembly hall. The exterior walls 16 ins. of brickwork first story and 12 ins. above, both walls with 2 in. air space, and are 20 ins. of brickwork first story and 16 ins. above. The walls of Longfellow School are also vaulted. The floors of the Hopedale school are calculated to carry a live load of 70 lbs. per square foot; those of the Longfellow School, 150 lbs. per square foot. The first floor of this school is mill construction, and the floors of corridors are of fire-proof construction.

The basement floors of Hopedale school are finished in concrete; of the Boston school, asphalt. Both schools have carrying partitions of brick, and minor partitions of spruce studding. The Boston school has three-coat plaster work and wire-lathed ceilings in assembly hall and boiler room; the other school has two-coat work and wood lathing throughout. The Boston school has double run of sash in schoolrooms, which are fitted with bookcases, and the walls above blackboards, and ceilings throughout are tinted with water color. These features are lacking in the Hopedale school.

Both buildings have iron stair-cases with rubber mats, both have sheathed dadoes and plain ⅞ in. baseboards.

The Hopedale school cost $27,320, or $4,553 per schoolroom.

The Boston school cost $68,308, or $5,692 per schoolroom.

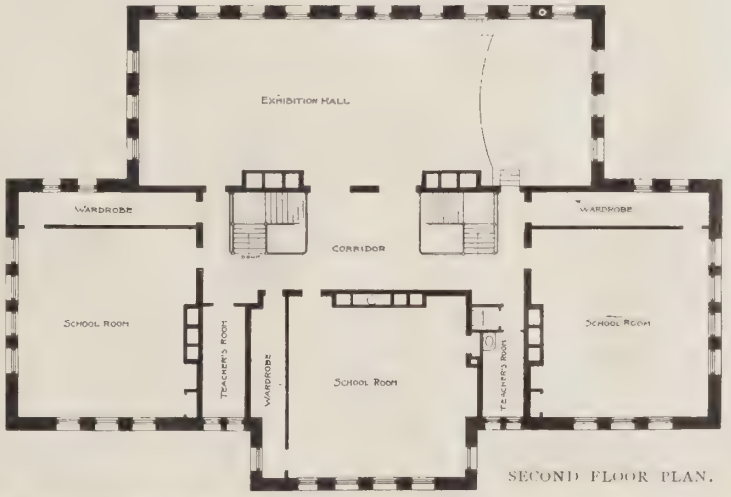
To account for this difference in cost, the first element to be considered is that of the greater expense of building in Boston above that in other places. This would be at least 5 per cent. of the cost in this case. We would, therefore, expect to build at Hopedale a building identical in all its features with the Boston school for $5,307 per schoolroom.

If the Hopedale school had been planned with separate "wardrobes," it would have cost $2,200 more, or $275 per schoolroom, *i. e.*, the cost would have been $4,828 per schoolroom; and further, if the Hopedale school had had as heavy brick and foundation walls, and the same strength of floors as the Boston school, the cost per schoolroom would have been increased $350, or to $5,178, and the general increase in cost of the building, if the Boston building law of 1892 had been followed in the construction of the Hopedale school, would have been $250 per schoolroom, or to $5,428. If the Hopedale school had had fire-proofing between floors, asphalt floors instead of cement in basement, double instead of single run of sash in schoolrooms, three-coat plaster and wire lathing of boiler room and assembly hall, bookcases in schoolrooms, and walls and ceilings above blackboards tinted,—factors of increased cost existing in the Boston school,—the cost per schoolroom would have been increased to $5,698.

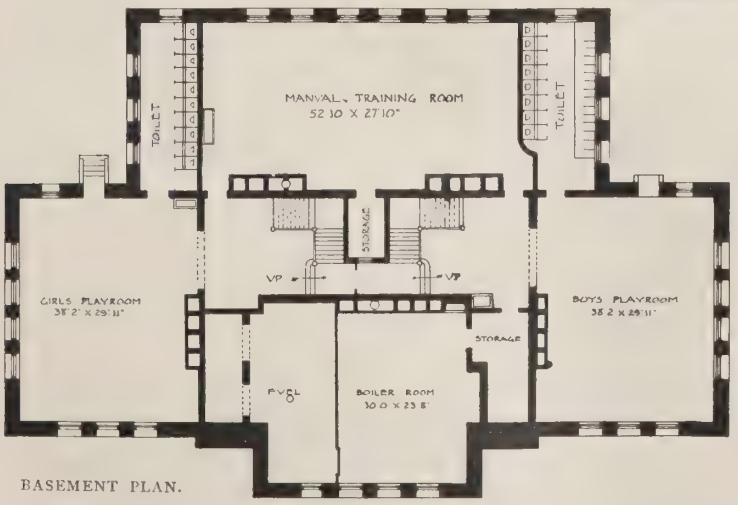
The Hopedale school was heated by indirect radiation. The



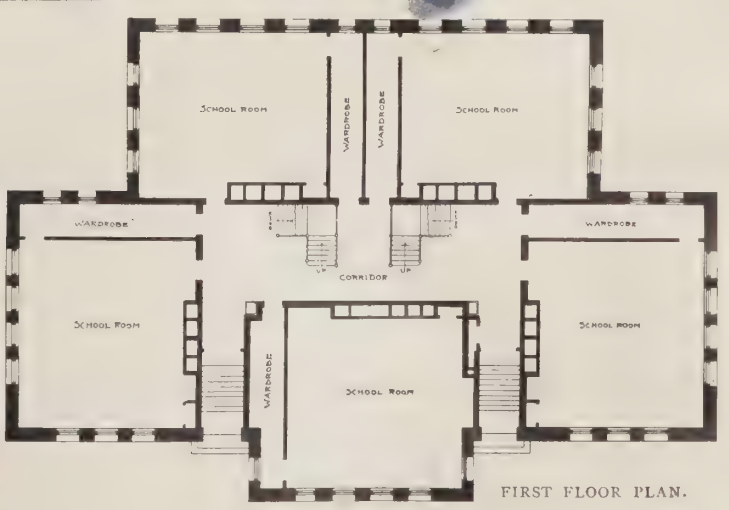
ROBERT GOULD SHAW SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.



SECOND FLOOR PLAN.



BASEMENT PLAN.

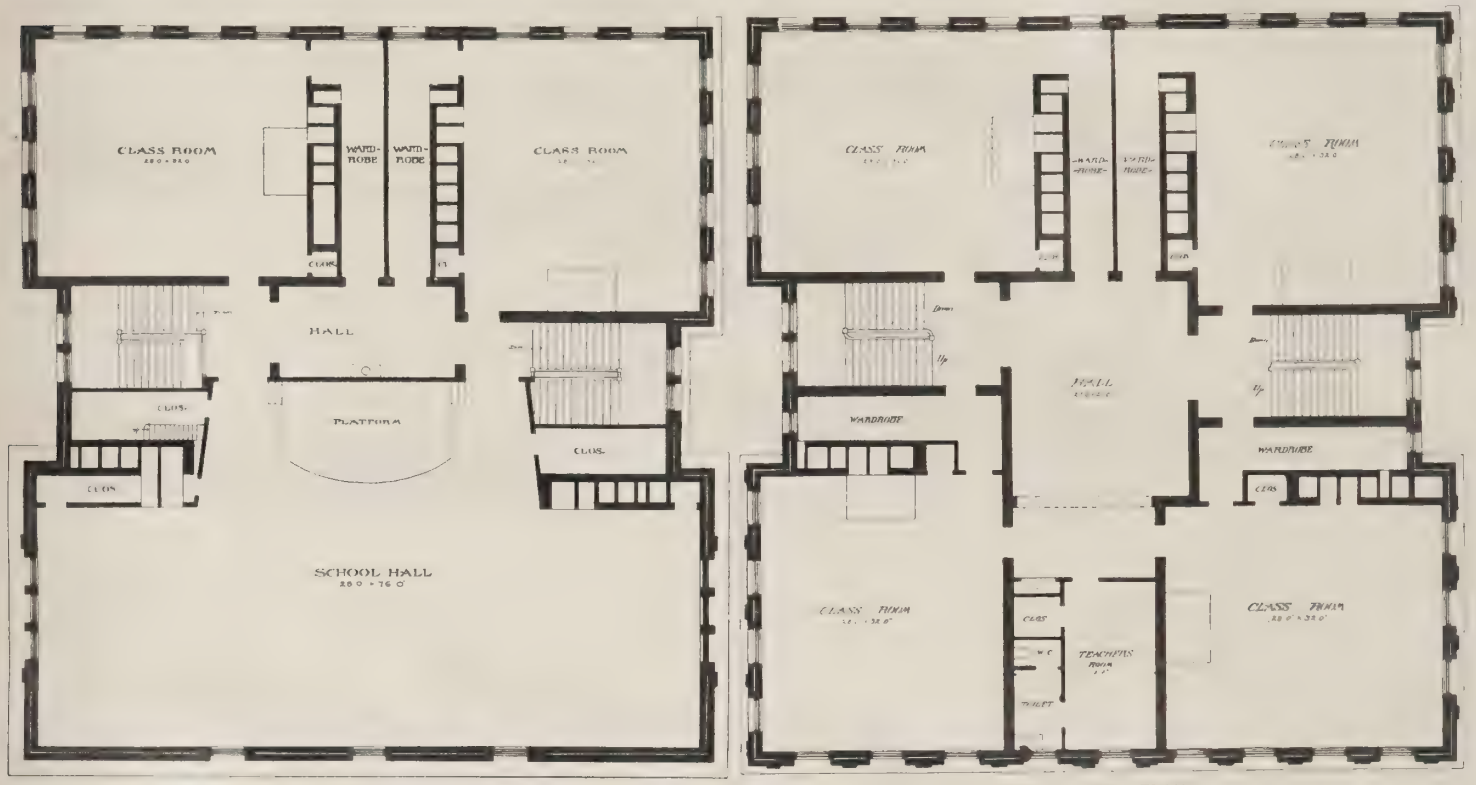


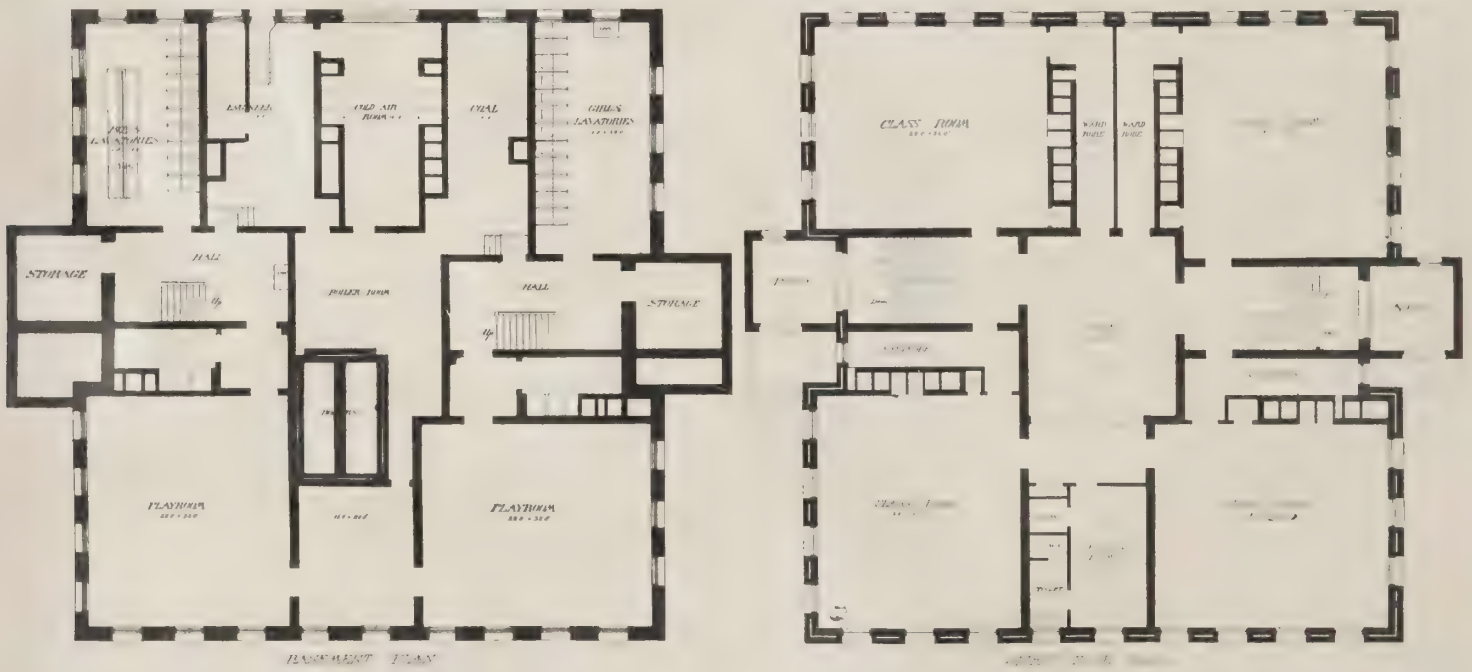
FIRST FLOOR PLAN.

ROBERT GOULD SHAW SCHOOL, BOSTON, MASS.

Boston school had a more perfected system of heating and ventilation, *i. e.*, the heating by direct radiation, and fresh air heated to 70 degs. supplied by a plenum fan. The cost of the heating plant of the Hopedale school was $2,700, or $335 per schoolroom; the cost of that of the Boston school was $7,854, or $655 per schoolroom. Let us suppose that the Hopedale school had been further improved by a heating and ventilating system like that of the Longfellow School, and we should expect a cost per schoolroom for such a building, with the other elements above premised, of $6,018.

We have seen that the expected cost of a school like the Boston school, if built in Hopedale, would have been $5,307 per schoolroom. It would appear that there was a difference of cost in favor of the Boston school, if both schools are considered fairly, of $711 per schoolroom. The greater size of the Boston school would make it normally 4 per cent. cheaper than the Hopedale school; we therefore leave unaccounted for $388 per schoolroom. It is evident that the Hopedale school, while less fully meeting the requirements of plan of the best graded schools, as it lacks separate wardrobes and has not certain important minor features, is more expensive in its architectural detail. This extra expense, which is mainly in cut-granite work, is probably not less than $175 per schoolroom. We thus see that, when fairly considered, that even if we credit the Hopedale school with its increased cost of architectural features as an advantage, that the Boston school is, when credited with value received in desirable features, $213 less expensive per schoolroom than the Hopedale school. In addition there should be credited to the Boston school fully $200 on account of the expense entailed by the required use of the "cart-wheel" form of plan. It may be said in passing that this





LONGFELLOW SCHOOL, BOSTON, MASS.

form of plan, while permitting the teacher to sit in all cases with back to a narrow end of a schoolroom and yet keep the principal light on the left of the pupils, has the disadvantage of increasing the cost of construction and of preventing a symmetrical external design. The latter consideration is, of course, a minor one if the method of lighting and control of the schoolrooms proves in practise to be bettered by such arrangement.

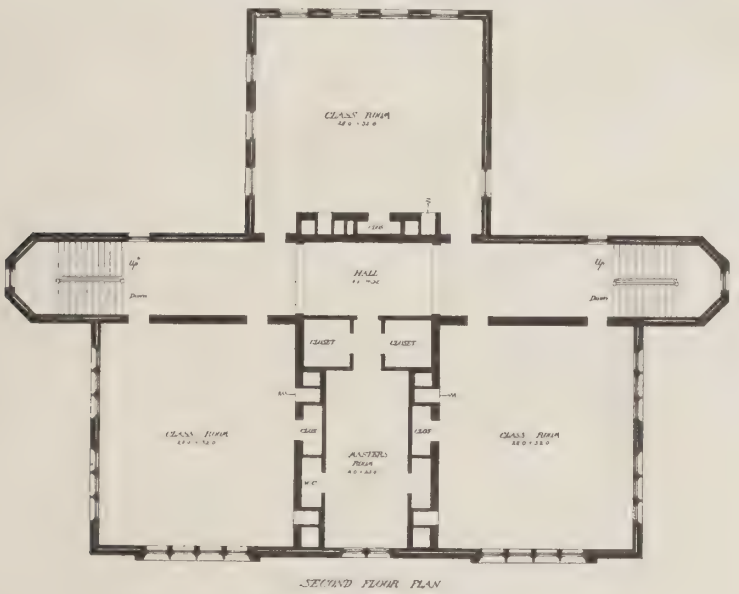
The Longfellow School deserves further credit on account of the fire-proof construction of its corridors.

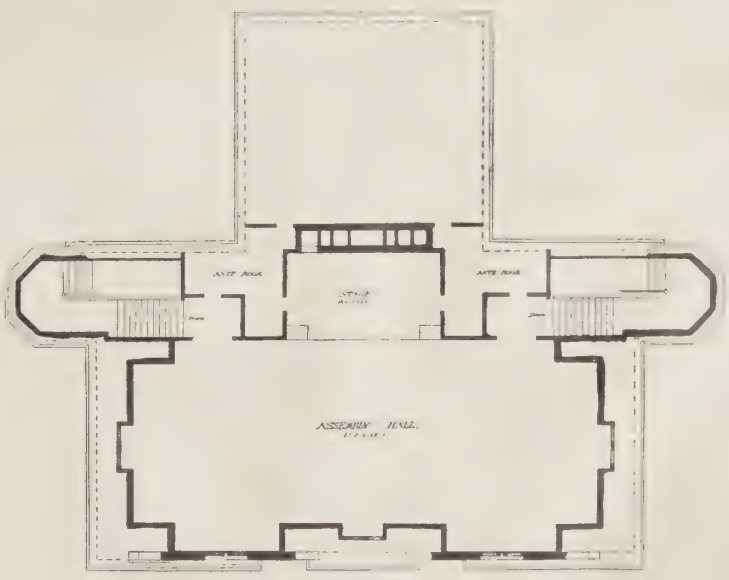


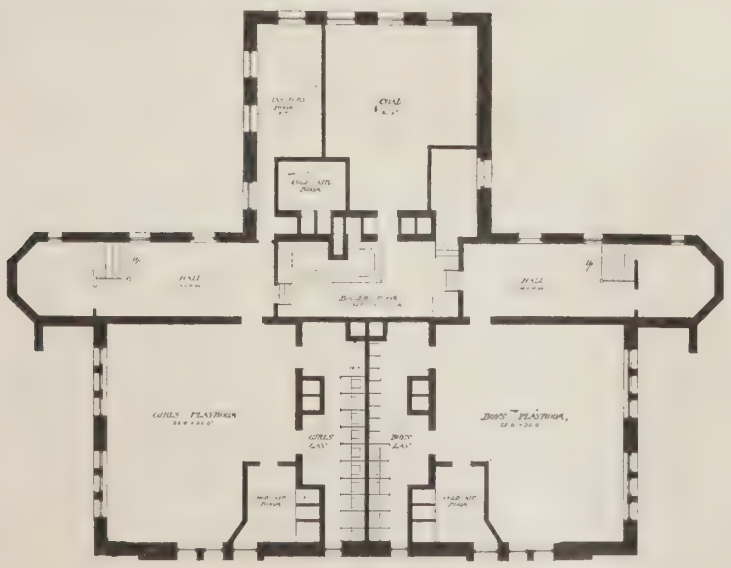
LONGFELLOW SCHOOL, BOSTON, MASS.
Walker & Kimball, Architects.

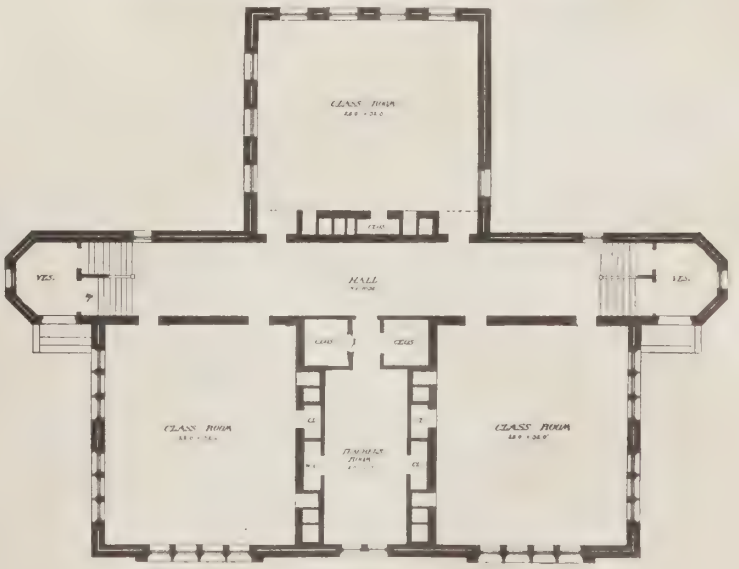
Let us compare the cost of the Longfellow School with that of another Boston grammar school built in its neighborhood previous to 1892—the Robert Gould Shaw School. This is a building two stories in height, of eight rooms and assembly hall, costing $54,215, or $5,421 per schoolroom. We have seen the Longfellow School cost $5,692 per schoolroom.

We would expect that the Longfellow School, being larger, would cost 4 per cent., and being built under the requirements of the law of 1892, would normally cost 7 per cent. more, *i. e.*, that in this comparison that the Longfellow School should be credited with 3 per cent. of its cost. We therefore credit it with $160 per schoolroom, setting the cost, for purpose of fair comparison, at $5,532 per schoolroom.









GRAMMAR SCHOOL, HOPEDALE, MASS.

The Longfellow School lacks certain desirable features existent in the Shaw School, *i. e.*, terra-cotta lumber minor partitions, cement finish in place of wood, wire-lathed ceilings throughout, hospital instead of ordinary ⅞ in. baseboard. These features add about $60 to the cost per schoolroom, so that to make fair comparison with cost of Shaw School, we should add this amount to the cost of the Longfellow School, making its probable cost, if built under the same law and of the same number of schoolrooms, and under the same specifications as the Shaw School, $5,592 per schoolroom.

The Longfellow School should be credited with its increased cost, due to the adoption of the "cart-wheel" plan, $200, to which should be added $170 per schoolroom on account of fireproof hall and corridor floors.

With this credit given, the unaccounted difference in cost between the Longfellow and the Shaw School appears to be $100 per schoolroom in favor of the former school.

The cost of the heating and ventilation of the Shaw School was $564 per schoolroom, or $91 less than that of the Longfellow School. It is probable that the latter school had a greater amount of direct radiating surface, as the Shaw School relied for heat as well as fresh air mainly upon its plenum fan, which was supplanted in the more exposed rooms only by direct radiation.

The Shaw School is certainly somewhat less expensive in its external treatment, as but little cut stone is used. If it were profitable to carry the analysis further, we would probably find the net difference in cost between the two schools accounted for by the greater proportionate amount of foundations and external brick wall in the Shaw School, which has the advantage of being two instead of three stories in height, and of not having its assembly hall in the roof.



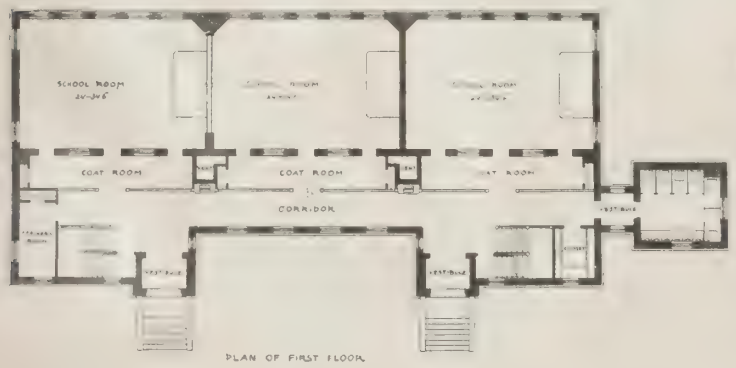
GRAMMAR SCHOOL, HOPEDALE, MASS.
Walker & Kimball, Architects.

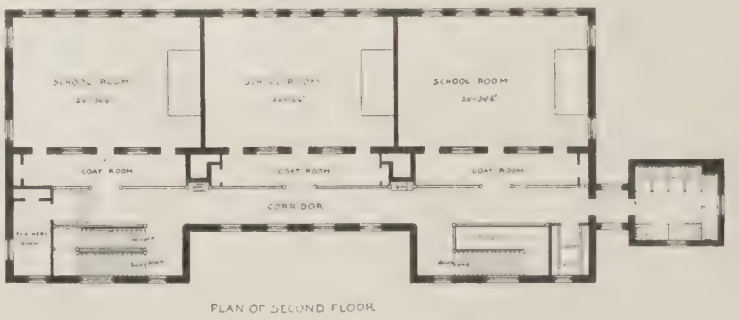
To more fully establish the fact that where requisite prudence and skill is shown by their designers, the cost of schoolhouses is due to the necessary cost of the features required therein, we will compare the cost of two six-room primary schoolhouses,— the Sewall School in Brookline, and the Margaret Fuller in Boston.

The Fuller School was constructed in accordance with the methods recommended in an earlier paper of this series, and was built under the law which held in Boston previous to 1892. The cost was $6,220 per schoolroom.

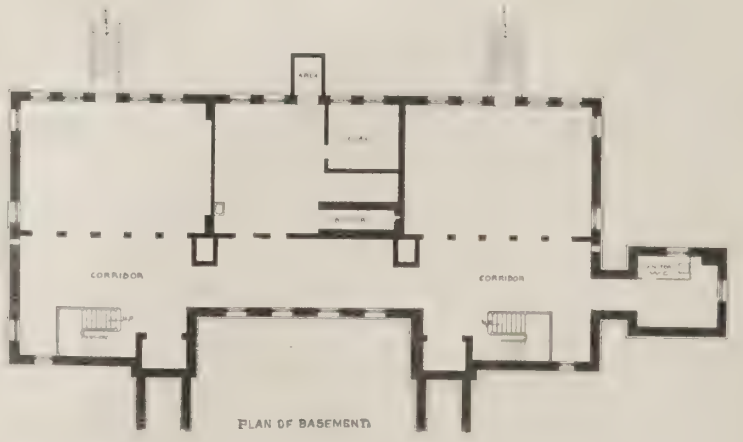
The Sewall School cost $5,557 per schoolroom.

A marked variation of the plan of the Sewall School from that commonly found is the adaptation of the toilet-room tower, a feature of some hospitals. The wardrobes are placed in the corridors enclosed in with screens, as in almost all Brookline schools, and as is, I should judge, the well-nigh general practise in Massachusetts outside









SEWALL SCHOOL, BROOKLINE, MASS.
Cabot, Everett & Mead, Architects.

of Boston. It differs from the Fuller School in the following points of construction: —

The exterior walls are 12 ins. with 2 in. air space; the interior bearing walls are 8 ins. instead of 12 ins., as in the Fuller School. The sashes are single run, minor partitions are of studding, except ceiling of boiler room, which is wire lathed; all plastering is on wooden laths, the staircases are of wood, the interior finish is of whitewood, the dadoes are of sheathing, and ordinary baseboards are used. The basement floor is of concrete.

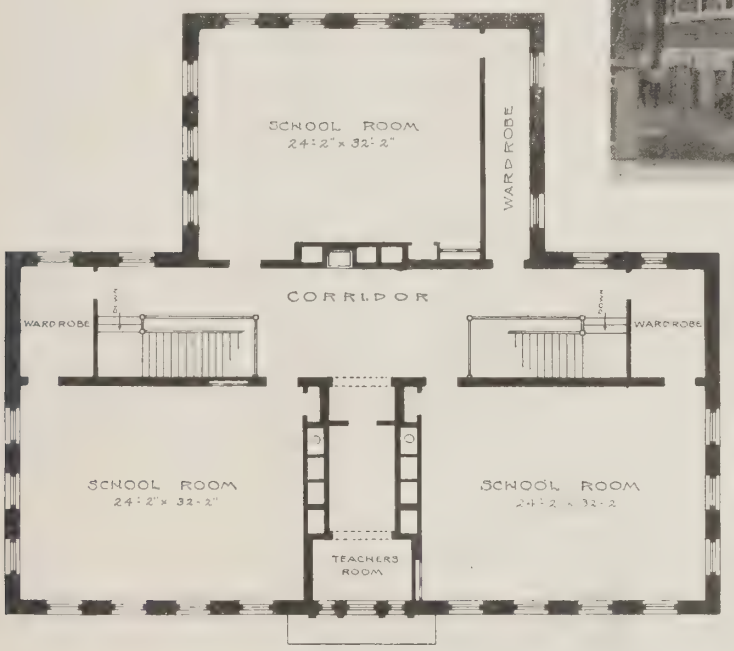
If the Sewall School had been constructed as was the Fuller School the features used as substitutes for those noted above would have increased its cost $900 per schoolroom; *i. e.*, if its construction had been that of the Fuller School it would have cost $6,457.



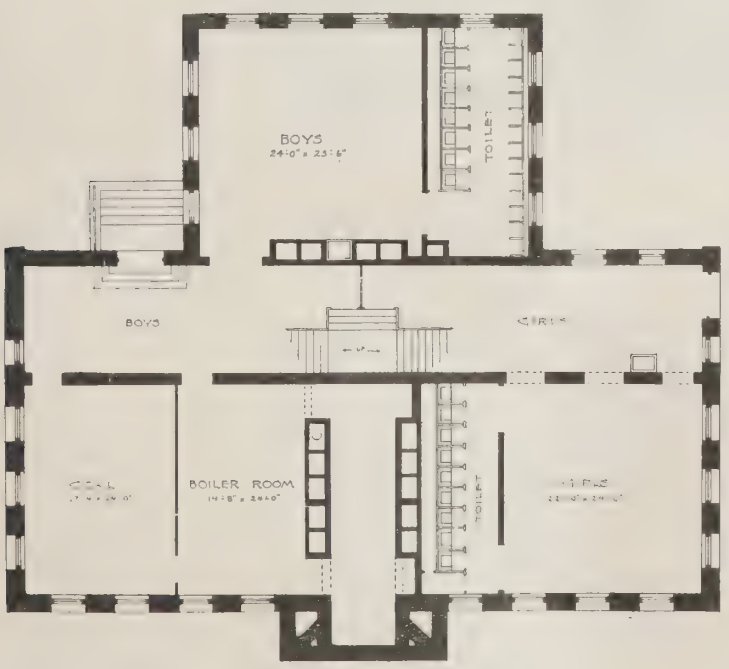
MARGARET FULLER SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.

This excess of cost is probably due in part to the greater length of schoolrooms,— in the Sewell School, 34 ft. 6 ins., instead of 32 ft.,— but more to the toilet-room tower, a feature which scarcely appears to be worth the increased expense, unless the space required for toilet rooms in the basement is needed for some other purpose, for there is no disadvantage in having the plumbing fixtures in the basement providing they are properly ventilated, as they readily may be, without any cost for ventilation, as will be later shown.

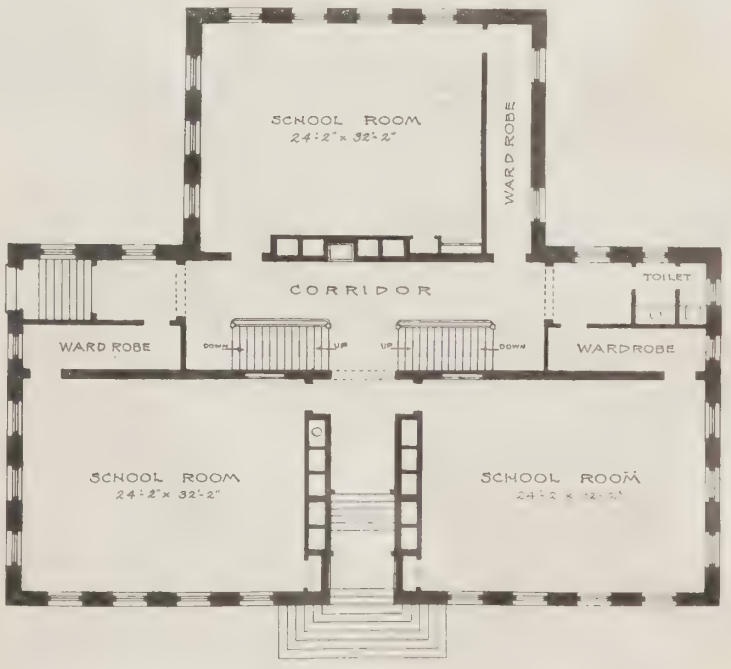
The omission of the middle window in the wall immediately facing the teacher is noteworthy in this plan. It is a method often found in French schools, and would appear to afford sufficient relief to the teacher's eyes to take away the excuse of pulling down the shades in the windows on this wall, as is often done, to the injury of the proper diffusion of light in the schoolroom.



SECOND FLOOR PLAN.



BASEMENT PLAN.



FIRST FLOOR PLAN.

MARGARET FULLER SCHOOL, BOSTON, MASS.

Brick and Marble in the Middle Ages.

BY G. EDMUND STREET.

(*Reprint.*)

I HAVE already spoken of the exquisite beauty of the inlaid marble in St. Mark's; nothing can be better than their effect, and nothing seems more wonderful than that they should not have been used more frequently in later buildings. I was, perhaps, a little disappointed in not finding, as I had expected, the marble arranged generally in geometrical patterns; but this is quite the exception; and one sees only, in a medallion here and there, the exquisite beauty which their arrangement in this way may produce. As a rule, the walls are faced with thin slabs of marble, each of the size in which it came to hand, sawn into as many slices as its substance would allow, and then riveted to the walls and held in place securely by projecting thin lines of stonework built into the wall, and cut with indented or billet ornaments along their edges. There is, however, a degree of real as well as apparent weakness which is not at all satisfactory in this system of incrustation, and I thought how much more noble such work might well become, were it to be inlaid only where no strong work was required to be done — as, *e. g.*, in spandrels of arches,[1] or within arches — and not, as here, to the concealment of every one of the necessary constructional features. It is to be observed, however, that the slabs of marble are generally higher than they are wide, so as at once to destroy any thought of their being really constructional.



ST. MARK'S, VENICE. WINDOW IN WEST FRONT.

The south side of St. Mark's is, perhaps, the place above all others in Venice where this inlaid work may be seen to the greatest advantage. Some of the great arches which stand in place of gables are divided into four or five square-headed lights by shafts supporting semicircular arches, the tympana of which are filled in with delicate and perpetually varied filigree work in marble, whilst above them a succession of panels or medallions shows all the resources of the rich materials which were to be exhibited. In another case, just over the entrance from the Piazzetta to the church, the tympanum of the arch is filled in with large medallions, one exquisitely carved, the others plain; whilst the arch of the window below the tympanum has its beautiful marble spandrels adorned on either side with medallions, which, for exquisite arrangement of vari-colored marbles in geometrical patterns, are perfectly admirable. There is enough, therefore, in the Venetian system of incrustation, though much unhappily be lost, to give ample food for our study and admiration; and its only weak point is, as I have said, its too frequent neglect or concealment of the constructional features of the buildings it adorns. It is easy, however, to cavil at particular details, and scan with a critical eye the architectural beauties of Venice; but let it not be thought for an instant that all the wonderful pictures which every new turn or new point of view brings before the eyes are unappreciated. A few days spent there suffice almost to fill a lifetime with reminiscences of all that is novel, beautiful, and strange; and days such as I have spent, year after year, rejoicing in the daytime in the full brilliancy of a September sun, and at night in the calm loveliness of a Venetian night, have been just the most delightful in every way that could be passed.

We were at Venice on the festival of the Nativity of the Blessed Virgin, — a great feast day, which it had been my fortune to spend some two or three times before in Roman Catholic countries. I confess that here we were not edified. We came in, as we went from church to church, for rather more than the usual number of the *désagrémens* which always seem to attend the decoration of the churches, and especially the altars, for such festivities abroad. The strongest impression left on my mind was one of wonder at the paltry character of the long array of what by courtesy are called, I suppose, wreaths of flowers, manufactured of pink gauze, or some equally unnatural material. These, with vulgar draperies hung outside the church doors, and in additional quantity about the altars, with the most noisy and gladsome ringing of bells, completed the external demonstrations; all the shops were most studiously closed, and the churches and open places were thronged with people. At St. Mark's, we heard[2] some abominably light opera music, which sounded, as may be imagined, very discordant within its solemn walls.

One morning we devoted partly to the ascent of the campanile in the Piazza. The ascent is entirely by inclined planes; the outer walls of the tower are, in fact, double, and in the space between them these inclined planes are formed, and it is worth notice that to this day, in all buildings which we have seen in progress in this part of the world, inclined boards are used instead of ladders for obtaining access to scaffolding, and in one of the mosaics in the entrance porch of St. Mark's, where the building of the Tower of Babel is depicted, precisely the same kind of arrangement is shown. This is interesting, as showing the tenacity with which old customs are adhered to. The view, when the top is reached, quite repays the labor of the ascent, as it gives the best possible idea of what Venice really is. We get an impression of a very densely populated town, hemmed in on all sides by water, and looking very flat and low; in the distance small islands pave the way to the mainland, or shelter us from the

[1] It was only so used in the Ducal Palace.

[2] I have heard a polka played by the organist in St. Mark's!



ST. MARK'S, VENICE. THE NORTHWEST CORNER.

sea; these, where they are more distant, look like mere black spots on the smooth, unrippled expanse of water, and in the far horizon we see to the west the purple outline of the mountains about Vicenza; and to the north of these, and rising grandly into the sky, the snowy peaks of the southern range of the Friulan Alps. Below and around are countless churches, all placed confusedly without respect to orientation — a neglect, if anywhere excusable, surely so here, where land is the exception and water the rule.

The last day we spent in Venice was most enjoyable. We had been all day in our gondola, now stopping to sketch some Gothic palace, anon shooting into some narrow canal to escape the bright heat of the sun, winding our way now here, now there, just as the fancy of the moment siezed us, and realizing more than ever that "the longest summer's day was all too short" for a last day in so fair a place. In the evening, just before sunset, we went out into the Lagoon, and, rowing round the small island of Giudecca, watched the gradually waning light reflected on the smooth, calm water, which seemed too silent and too soft to be disturbed by a word from any of us; and then at last, turning back and coming suddenly through a short canal into the main stream just opposite the Dogana, we moved on gently till we came abreast of the Ducal Palace. The moon was rising behind us in all her beauty, and in front, lamp after lamp was suddenly lit along the Piazetta, then along the palace front, all along the Riva dei Schiavoni, until at last, before we landed, the bright lights, reflected in a hundred gleaming, flashing lines, were fitfully dancing in long streams of light upon the bosom of the waters.

We stepped on shore, to find ourselves led on by the sound of military music, and to be tempted by the luxury of ices eaten *al fesco* in the Piazza; and then, when the crowd gradually dispersed, we, too, among the last, found our way to our hotel, charmed so much with our last night in Venice that it is impossible not to recollect that evening with the deepest pleasure.

It is not without purpose that I have held silence with regard to the churches and buildings generally of the Renaissance school in Venice. These have had in their time many more admirers than have the examples of architecture which it was alike my business and my delight particularly to examine; and to the present day I doubt not that nine people out of ten, led by their *valets-de-place*, go to see what is worst in point of taste, and so reap the reward of allowing themselves to be made to see with another's eyes, instead of enjoying the intense pleasure of working out and exploring for themselves all the treasures of this mine and storehouse of ancient art. It is partly because I feel the greatest repugnance to the buildings themselves, and partly because I fear to make my notes, already lengthy, far too long for the patience of my readers, that I do not venture upon this additional field of study; but not in the least degree because I doubt the result, for I believe firmly that, tried by the fair rules which must regulate merit in a constructive art, the Renaissance buildings of Venice would be no nearer perfection than those of any other city. Something perhaps there is in the gloomy grandeur of their vast masses, rearing their rusticated walls and deeply recessed windows darkly above the comparatively cheerful and bright-looking walls of the neighboring Gothic palaces, which may impress the minds of some, but they must be of a somber temperament who really love them. Still more must they be of a tasteless temperament who can endure with patience the succession of eccentricities with which Palladio and his disciples have loaded their churches. I pretend not, however, to discuss the point. I had not time for everything, and preferred giving up the attempt to like what from my heart I have ever disliked, and what nothing that I saw in Venice would make me dislike at all less heartily.

Neither do I pretend to say anything about Venetian pictures; guides without number may be found of more service and more knowledge, and to their hands I leave their proper charge. A word



ST. MARK'S, VENICE. SOFFIT OF ARCHIVOLT OF CENTRAL DOOR, MAIN FRONT.



ST. MARK'S, VENICE. VIEW IN THE NAVE.

only upon one point — their adaptation, namely, to the sacred edifices of which they are the most notable ornaments.

Now I must at once say that there is no church, so far as I saw, in Venice, with the single exception of St. Mark's, which is to be compared in this respect (in its effect, that is, as heightened by color) with such buildings as the Arena Chapel at Padua, or the church of Sta. Anastasia at Verona — the one an example of the very noblest art working under strict architectural limitations; the other, of simple decorative painting. The fact is, that the Venetian pictures give the impression that they might do elsewhere as well as in a church, and therefore entirely fail in identifying themselves with the walls on which they hang; whilst no one can ever think of the noble works of Giotto at Padua without recalling to mind the religious order of his works and their identification with the building which contains them; and at Verona the result of the system adopted in the painting is marvelously to enhance the effect of the architecture without in any way concealing or damaging it. In Venice the case is quite different. The church of San Sebastiano, in which Paul Veronese is buried, and which internally is almost entirely covered with his paintings, is an example of what I suppose I must call the best Venetian treatment. This consists, however, of immense oil paintings covering entire walls, and absolutely requiring, in order that they may be at all properly appreciated, that the spectator should stand in a particular spot,— in some cases by the side of the altar,— and that the windows should first have blinds drawn down, and then, when he goes to look at another painting, have them drawn up again. This is all very unpleasant. But besides this, there is no very sensible advantage to the color of the buildings from these decorations: certainly they are far behind mere decorative paintings as vehicles for bringing out the architectural features; and so they are visited very much as pictures in a gallery, and without in any case being identified with the churches in which they are preserved. The mosaics at St. Mark's are, on the other hand, some of the very grandest examples of the proper mode of decorating interiors with representations of religious subjects, all conceived and arranged with some order and relation to each other. But of the other Venetian churches there does not seem to me to be any one whose artists at all succeeded in equaling the example so early set them.

I do not pretend, in these pages, to speak at all of paintings irrespective of architecture, or I might find much to say upon the store of works of a very noble school in which this great city is so rich. The immense rooms of the Ducal Palace, covered as their walls and ceilings are with the works of Tintoretto, Titian, and Paul Veronese, cannot be forgotten, still less can the many works of Giovanni Bellini, and of other painters in the churches, and in the collection in the Accademia — rich among others in the works of that great and interesting painter, Carpaccio,— be passed over, whilst the decorated walls of the various Scuole are in many cases of hardly inferior interest. I am sorry that I was obliged to take the great merits of some of the grandest works somewhat on faith; it was in vain to think of actually studying them in a short time, and, educated as I have been, to love the works of an earlier date and another school more heartily than these, I must confess, barbarous as the confession may appear to be, that I was not thoroughly pleased with what I saw. The magnificence of the chiaroscuro and coloring of these great pictures scarcely atoned to me for the degree to which, owing generally to the immense array of figures and confusion of subject, I failed to carry away distinct conceptions of the story intended to be told. It may be said that this is the result of want of taste or education, but still the feeling is so different when for the first time pictures by Fra Angelico, Giotto, Raffaelle, Perugino, or Francia are looked at, that it is hard to avoid believing that, though their power over color may have been somewhat less, their power of attaining to the highest point of the true painter's art, that of leaving indelible impressions on the minds of all beholders, was immeasurably higher. Thus much only by way of excuse for not saying more about what the world in general rightly conceives to be one of the great glories of Venice.



ST. MARK'S, VENICE. THE NARTHEX.

Fire-proofing.

THE LIVINGSTON BUILDING FIRE.

APROPOS of the recent fire in the Nassau Chambers in New York, Chief Bonner is quoted as saying that there is no such thing as a fire-proof building. The experience of the Livingston Building points to a very different conclusion. This structure was designed and erected by Hill & Turner, in New York, and has been occupied for about a year for light manufacturing purposes. The building is fire proof in its construction according to the most approved types. The beams are protected by 8 in. end construction, hard, hollow-tile arches of spans of about 6 ft., the bottom flange of the beams being protected by the terra-cotta being carried underneath. Each story is practically undivided, a narrow stairway being carried along one of the party walls adjoining the elevator, both the stairway and the elevator being enclosed by a solid plaster partition. The doors and door casings are of wood covered with asbestos and a surface of metal. Late in the afternoon of January 18 a fire was discovered in the fourth floor, which was occupied by furriers, and was stored full of highly combustible material, besides having a quantity of low wooden partition work. The outside windows on two streets were quite large and the glass was speedily broken so the flames had ample supply of air, and all the conditions were favorable for developing an intense heat. The fire had headway of about twenty minutes before the firemen were able to get at it, and there is abundant evidence of the extreme heat developed, as shown by the brass castings of some of the steam radiators which were melted entirely off, as well as by the fact that the steam pipes became so softened that they sagged out of shape. In fighting the fire, three or four lines of hose were carried up the stairway and jets of water directed from the door opening directly into the undivided room. Tarpaulins were banked up across the inside of the threshold to form a dam, which enabled the firemen to flood the whole story with water until it ran over outside the window sills. A water tower also threw a heavy stream of water in from the outside.

The contents of the story and the wooden finish were destroyed. In one place on the ceiling, in such location as would indicate that it was a special focus for the streams from the firemen's hose, a section of the bottom flanges of the floor arches was broken or burned away, this whole section being somewhat less than 3 ft. square. The vertical webs of the terra-cotta were intact. At another position near one of the outside windows, a space of a few inches square was missing from the bottom flange of one of the floor arches. As far as could be ascertained, this was the only damage to the terra-cotta. The ceiling throughout was heavily plastered with machine-mixed mortar. This plastering had come off in a number of places, but nowhere, except at the points mentioned, was there any appearance of damage of any sort to the terra-cotta. None of the ironwork seemed to have been affected a particle. The flames lapping outside the building communicated to the upper story, but beyond the smoke and water no damage was done above the floor in which the fire started. In the story below, occupied by a tailor shop and crowded by material, a relatively slight amount of water came through from above, but not sufficient to cause any damage. The heat against the outside walls in places was so intense that over considerable areas of the brickwork, which is of hard, thoroughly well-burned red brick, the surface was entirely gone for a depth of from one eighth to one fourth of an inch. On the exterior of the building, which is finished entirely in brick and terra-cotta, there was some damage to the projections of the belts and cornices in the lower stories caused by the firemen. In a few places, also, the corners of the brick piers in the fourth story were slightly corroded by the heat, and, of course, the smoke made the building appear to be damaged considerably in the upper stories. The extent of the structural damage, however, can be appreciated by the fact that though the building cost over $100,000, we are informed that the insurance companies have offered to settle all the fire loss for $5,600. The fire occurred on Wednesday afternoon. The following morning the electric plant and the elevator were in operation and constant use, and on Friday morning manufacturing was started in the lower story.

There was sufficient heat developed to have utterly destroyed any ordinary construction, and the lessons of this fire are particularly valuable as showing that it is perfectly possible to so construct a building with terra-cotta rightly used that no fire from within can any more than burn out the contents.

REPORT ON A RECENT FIRE-PROOFING TEST.

WE have had occasion to make several comments upon tests of building materials, and though the subject is one which probably will never be permanently settled, and there will always be an irrepressible conflict between the various mediums which are used for the fire-proofing of building constructions, and differences of interpretations of tests, no less than the differences of measurements of values, will always be biased by the point of view, we feel that, in justice to the burnt-clay industries which we represent, it is fair to call attention to some points which ought to be considered in forming a judgment of a recent comparative test in New York. Our readers can draw their own conclusions as to the value of such tests and the importance thereof. On November 19 a fire test was made of two constructions, one a suspended concrete system and the other a terra-cotta block end construction. The terra-cotta was purchased in the open market, and theoretically represented the product that is put forward by the manufacturers; but the deductions from the results of the test were so at variance with recognized facts that Mr. H. M. Keasbey, the president of the Central Fire-proofing Company in New York, felt that it was desirable to investigate a little more closely the conditions under which the terra-cotta was tested. This investigation was conducted by Mr. Julius Franke, architect, who reported as follows: —

"On October 19, when I made my first inspection, the hollow-tile arch had been built, and as no concrete had then been put on top of the same, I noticed that the key of the arch was not in the center, that tiles of different patterns, not made to be built into the same arch, were used, and that some of the cement mortar which I took off the top was very poor, the same crumbling between my fingers.

"I found that the concrete arch, which had been built alongside of the tile arch as per drawing attached hereto, was so placed that if the space, about one fourth of an inch between the plates, marked 'A' on the drawing, were filled up, the expansion of the concrete arch, which could be caused by fire, would deflect the beams, causing a lateral thrust along the top of the hollow-tile arch. This would cause damage to the latter, particularly as its key was not in the center.

"After the fire test I examined the arch again and found that the middle third, including the skew-backs, had fallen, and that the two thirds remaining had joints open at the bottom; but that most of the mortar with which the bottom of the tiles had been plastered had remained on the tiles, and that the space between the plates marked 'A' on the drawing had some cement or mortar in the same. I also found that the concrete filling on top of the arch was very poor, not being strong enough to resist any strains.

"The fact that the mortar remained, and also that the sides of the kiln or oven were damaged very little, showed that the damage done to the arch by fire must have been very slight. I therefore came to the conclusion that the arch failed because it was improperly built, having the key off the center, being constructed of different patterns, and because the cement was not of the best; and also because when the concrete arch and concrete beams formed by boxing the tie-rods became hot they expanded and caused a movement in the joints of the tile arch by a lateral thrust. This weakened the arch sufficiently to allow the weight which was on top to act upon the arch block marked 'X,' causing it to slide and break the arch.

This could all the more readily happen as the style of arch employed was an end construction of a pattern that had very little bearing surface at the joints of the arch, and very little or no side bond, and also because the concrete filling was very poor; so that if only one key or arch block gave way and let down its load, the rest would follow, particularly with a load of cobble stones such as was on this arch."

This report and the results of the test seem to emphasize what is admitted by all experts on fire-proof material, namely, that terra-cotta, though of itself admittedly a perfectly satisfactory medium for fire-proofing, must be set right in order to accomplish its purpose, and that no test of a material is reliable which shows failure to be caused by improper workmanship.

FAILURE AND EFFICIENCY IN FIRE-PROOF CONSTRUCTION.

UNDER the above title an article appeared a short time since in the so-called technical department of the *Architectural Record* which undertook to compare some existing systems of fire-proof construction, drawing conclusions therefrom that terra-cotta was a failure as a fire-protecting medium, and that the only proper material to use was a system of concrete construction as designed and applied by a particular firm. The fact that the article in question appeared in what would more properly be styled the advertising department of the *Record*, and that it was evidently inspired by the firm whose product was placed at the head, robs it of its value as a statement of exact conditions. It is perhaps hardly worth while to undertake a criticism of an advertisement except in as far as appearing in the form referred to it may have seemed authoritative. It takes up terra-cotta, weighs it in the balance, finds it wanting, and summarily disposes of it so that nothing is left; and yet, strange to say, the very instances which the article quotes as demonstrating the failure of terra-cotta are the very ones which are quoted by the warmest advocates of burnt clay, to support their claims in regard to this material as a fire protector. On the other hand, judging from this article, concrete is impregnable, and whether attacked by fire or water, no matter what the degree of exposure, it is absolutely unyielding. Now a little common sense will show that this is not a correct statement. While our position is that terra-cotta affords all the needed protection for the most severe exposures to which any ordinary building is subjected, it is beyond question that even the best of terra-cotta applied in the most thorough way could be destroyed utterly by a sufficient degree of heat; but long before the best kinds of terra-cotta would begin to melt and run down, a condition which, judging by the *Record* article, is a usual concomitant of exposure, any cement construction would be heated to redness if not entirely destroyed, and concrete which is red hot is not a very efficient protection for structural steel work. The question of fire-proof material is really a very simple one, and any one who is so disposed can make the most convincing sort of test by taking a small fragment of ordinary porous terra-cotta and a small fragment of the cinders concrete which is usually employed for concrete constructions, and holding a piece of each in his hands, expose the other end to the flame of a blowpipe. He will drop the piece of concrete first. Some time afterwards he will have to drop the terra-cotta. If while hot they are dropped directly into a bucket of water, the most casual inspection will satisfy any one that what is left of the concrete is hardly the material that is most desired for the protection of a building. Concrete is cheap, terra-cotta is not; therein lies the secret of the possibilities of the use of the former material.

Another point. If terra-cotta arch blocks are set in place with only ordinary care, they can be depended upon to serve their purpose. Concrete, on the other hand, has to be mixed most carefully in order to secure a uniform and reliable product. As, in a large building, the bulk of the work is of necessity entrusted to laborers who can be depended upon *not* to think or be careful, the chances are decidedly against a satisfactory mixture of concrete, thereby largely increasing the odds in favor of terra-cotta.

Mortar and Concrete.

WE publish below a circular recently issued by the Committee of the American Society of Civil Engineers, on the Proper Manipulation of Tests of Cement, and we would specially direct the attention of our readers to the questions contained in this circular and to the request of the committee for information upon this important matter. It is well recognized that the testing of cement, unlike the testing of metals, rests upon a very insecure foundation, and different manipulators succeed in getting from the same material, results varying sometimes by several hundred per cent. It is for the purpose of devising, if possible, some rules of manipulation which will prevent such diversity that this committee has been appointed, and it is hoped that it will receive the support of those who manufacture or use cement. The attention of our readers is specially directed to the fact that copies of the circular may be obtained from the chairman of the committee, who desires that this circular may reach all persons who would be likely to give the committee the benefit of their experience.

BOSTON, Jan. 15, 1898.

Dear Sir:—The Committee on the Proper Manipulation of Tests of Cement earnestly requests that you will give full and careful consideration to the following questions, and that you will, as soon as convenient, send to the chairman complete and explicit replies, giving the result of your experience and the embodiment of your views. Any additional suggestions or information bearing upon the subject which you may desire to communicate will be thankfully received by the committee.

This circular has been sent to every member of the American Society of Civil Engineers, and to many others, but in order that it may reach everybody whose opinion will be of value, you are requested to mention the names and addresses of any persons, not members of the Society, who, in your opinion, should receive it, and who will be likely to assist the committee in its work.

You are also requested to send with your answer copies of any specifications for cement which you may have used, or any other information bearing upon the subject, which you think would be of interest.

As the duties of the committee will require considerable time and labor, you are earnestly requested to respond as promptly as is consistent with a careful consideration of the questions asked.

Yours very truly,

GEORGE F. SWAIN, *Chairman;*

O. M. CARTER, W. B. W. HOWE, ALFRED NOBLE, L. C. SABIN, GEO. S. WEBSTER, HERBERT W. YORK, *Committee.*

Address: Prof. GEO. F. SWAIN, Massachusetts Institute of Technology, Boston, Mass.

SAMPLING.

1. In the works which you have carried out, how much cement have you been willing to accept on the results obtained with a single sample?

If this depends upon the kind of work or reputation of cement, please indicate.

2. What method do you recommend for obtaining a sample from a package?

3. Do you mix cement taken from several packages to obtain a sample to use in testing, or are the samples from the several packages kept distinct?

CHEMICAL ANALYSIS.

4. When do you consider a chemical analysis essential or desirable?

5. What elements or compounds should be determined?

6. What do you consider the best methods of determining these compounds with sufficient accuracy?

MICROSCOPICAL TESTS.

7. Are microscopical tests of value, and, if so, when?

8. What power microscope is required, what observations should be made, and what are the indications?

FINENESS.

9. What sizes of mesh should be used in testing fineness of Portland cement? What for natural cement?

(If these questions are answered by stating the number of meshes per linear inch, please mention, also, the size of wire without reference to any wire gauge.)

10. What should be the diameters or sizes of the screens?

11. How large a sample should be tested?

12. Should any machine for shaking be used, and if so, what form, and what should be its manipulation?

13. How long should the shaking be continued?

14. Should there be any difference in manipulation for fine and coarse screens, or for different kinds of cement?

APPARENT DENSITY OR WEIGHT PER CUBIC FOOT.

15. What is your opinion of the value of this test?

16. What apparatus do you prefer, and how should it be used? (Please state any special precautions to be observed.)

TRUE DENSITY OR SPECIFIC GRAVITY.

17. What is your opinion of the value of this test?

18. What apparatus do you prefer, and what is the method of manipulation? (Please state any special precautions to be observed.)

STANDARD SAND.

19. What kind of sand should be used in tests of mortars? Would you recommend a natural sand or crushed quartz?

20. What fineness should be specified, and what degree of variation in size of grain should be allowed?

PREPARATION OF PASTES AND MORTARS FOR TESTS OF TIME OR SETTING, SOUNDNESS, AND STRENGTH.

21. Should the same method of preparation be used for each test?

22. How should proportions be stated?

23. What should be the consistency of the pastes and mortars for the various tests, and how may this consistency be specified and determined in order that similar results may be obtained by all operators? (This question is intended to embrace, not only the correspondent's views as to what consistency should be used, but also as to devices for determining when the proper consistency has been obtained. It is hoped that this question will receive full and careful consideration.)

24. What should be the temperature of the materials used in mixing?

25. What should be the temperature of the air at mixing?

26. How should the quantity of water used in mixing be defined?

27. What should be the method of mixing?

28. Do you prefer hand or machine mixing? If the former, please describe manipulation in detail.

29. If the latter, what machine do you prefer, or what form would you suggest for trial?

30. Do you know of any machine that has given good results? If so, what is the method of manipulation, and what are its advantages and defects?

31. How long should the mixing be continued? Should this be defined by stating the length of time, or by reference to the character of the resulting mortar?

TIME OF SETTING.

32. What do you consider the best method of determining the time of setting? (Please describe apparatus and manipulation.)

33. How shall the beginning of the set be defined?

34. How shall the end of the set be defined?

35. Should this test be made on neat cement paste, or on mortars, and if the latter, what proportions of cement and sand should be used?

36. What should be the consistency of the mortar? (See 23.)

37. What should be the temperature of materials and of air, quantity of water, and method of mixing? (See 24, 25, 26, 27.)

38. What should be the method of making the pats, or of filling the molds, if they are used?

39. How shall the pats or briquettes be treated during setting?

40. What should be the temperature of the water in which pats are placed?

SOUNDNESS.

41. What do you consider the best test for soundness in the case of Portland cement? What in the case of natural cement? (Please describe in detail the process recommended, and indicate any necessary precautions to be observed. If the process you prefer is too elaborate for any but a well-equipped laboratory, please indicate, if possible, any modifications for ordinary use, and give your opinion of the reliability of such simpler tests.)

TENSILE STRENGTH.

42. What proportions of cement and sand should be used in mortar for tests of tensile strength?

43. Do you advocate adhering to the American Society of Civil Engineers' form of briquette in future requirements? If not, what form do you prefer?

44. Is your preference based on comparative experiments, or is it the result of satisfactory experience with one form?

45. Upon what sort of a surface should the briquette be made?

46. Should the briquette be finished with a trowel on both sides?

47. What should be the consistency of the mortar? (See 23.)

48. What method of filling the molds do you advise? Do you recommend the use of a machine for molding, and if so, what form would you suggest?

49. Have you used the machine you suggest, and have the results been satisfactory?

50. How should the briquettes be treated during the first twenty-four hours after molding?

51. How should they be treated during the remaining time until tested?

52. If placed in water, how often should the water be renewed, and is it important that it should be maintained at a nearly constant temperature? What should that temperature be?

53. At what age should briquettes be broken for acceptance tests on ordinary work?

54. Under what conditions would you deem it essential to make longer time tests?

55. Will weighing briquettes before testing give information of value, and, if so, what?

56. What form of clip do you prefer?

57. What should be the distance between opposite gripping points of the same clip?

58. What should be the rate of applying the stress?

59. What style of testing machine do you prefer?

60. Can you suggest any desirable modifications to machines now in use?

61. What special precautions are necessary in breaking briquettes?

COMPRESSIVE STRENGTH.

62. Do you advise compressive tests, and, if so, why?

63. What form and dimensions of test piece do you prefer?

64. Should the test piece be treated differently as regards manipulation of mortar, mixing or setting, from tensile specimens? If so, please state in what particulars, and why.

65. How should the specimen be prepared for the testing machine?

66. What form of testing machine do you recommend?

67. What should be the rate of applying the stress?

TRANSVERSE STRENGTH.

68. Do you advise bending tests? If so, under what conditions and why?

69. What form and dimensions of test piece do you prefer? What span?

70. Should the test piece be treated differently as regards manipulation of mortar, mixing and setting, from tensile specimens? If so, please state in what particulars, and why?

71. What form of testing machine should be used?

72. What should be the rate of applying the load?

MISCELLANEOUS.

Under what conditions do you consider the tests indicated below necessary or desirable? What should be the manipulation for the test if used?

I. — Adhesion.

II. — Abrasion.

III. — Resistance to freezing.

IV. — Resistance to action of sea water.

The Masons' Department.

CONCERNING THE RIGHTS OF CONTRACTORS AND AUTHORITY OF ARCHITECTS.

IN response to the application of Lynch & Woodward for an injunction against Josiah Quincy *et al.*, Judge Richardson, of the Massachusetts Superior Court, has passed upon the merits of the case in a decision which is of unusual interest to architects, contractors, and mechanics. The facts which led up to the legal proceedings are briefly these: Messrs. Lynch & Woodward obtained the contract for heating a public bath house now being built for the city of Boston, on Dover Street. In their contract with the city was a clause which has of late been inserted in all contracts for city work, providing that "preference shall be given to union labor." Messrs. Lynch & Woodward had up to the time of signing this contract run what is known as a non-union shop — that is to say, they did not discriminate between union and non-union labor in the employment of their help. When these contractors started to perform their work at the bath house they claim that they announced their willingness to employ members of the union to do this particular work provided they could obtain a sufficient number of efficient workmen of this class — that is to say, union men. Apparently the Steam-Fitters' Union thought, under the existing conditions, they had an opportunity to force the contractors to run a union shop, and so union men stayed away from the job. The contractors, after making known their readiness to employ union labor and finding that they could not obtain a sufficient number of skilled mechanics of this class, and having, as they thought, fulfilled the conditions of their contract as regards this particular condition, then proceeded to perform the work with non-union men. The contractors began work under the contract about Nov. 1, 1897. On November 4, and again on November 13, they were ordered to suspend work for a time; finally, on January 8, the mayor caused a letter, signed by the architects, but prepared by him, to be sent to the contractors, ordering them to "discontinue all further work under the contract," and caused members of the police force to forcibly exclude the contractors from the building, thereby preventing them from finishing their work, which was nearly completed. The decision reads, "there was no evidence that at any time any of the materials furnished by the plaintiffs was not suitable, or that their work in any respect was unworkmanlike, or that they employed incompetent workmen, or that members of the labor unions were more competent than the workmen whom the plaintiffs had, or that the work was not in all respects being properly done." In a letter signed by the architects, which on Jan. 6, 1898, the mayor caused to be sent to the contractors after referring to a previous notice to suspend work, is the following paragraph: —

"You are now notified to proceed with all possible despatch to complete your work under said contract as if said notice of November 13 had not been given; but you are further notified that if any non-union men are employed by you on such work you will again be requested to dismiss them under article 3 of said contract, and that you will not be allowed to proceed to finish your work with non-union men."

Relative to this action the decision says (and all architects should take notice): "At the hearing it was admitted that this letter also was prepared in the mayor's office, and the only part which the architects had in it was to sign it at the mayor's request. The provision in said article 3, construed in view of the obvious purpose of it, and with other parts of the contract, did not, in my opinion, give the architects the power to arbitrarily order the plaintiffs to dismiss all their workmen and thus to effectually end the contract for no reason, or for the reason merely that they employed non-union men. The right reserved to the architect in that article 3 was to be exercised only for causes which pertained to the fitness or qualifications of the workmen for the performance of their work." This opinion as to the architect's control of laborers on a piece of work is an important point for him to be familiar with and is in violation of many of the conditions of building contracts which, as a rule, architects seem to consider valid.

The decision then goes on to state that at the hearing the mayor claimed that he did not rely on the breach of any stipulation in the written contract for his right to take the work away from the plaintiffs, but upon the oral promise of one of the contractors to him that he would employ union men only. On this point the decision says, "Such a promise, if made, had, in my opinion, no validity, and if it was given and not kept, the plaintiffs' failure to keep it was, upon the evidence, more the fault of the defendants than the plaintiffs." Reference is then made to the fact that the plaintiffs were evidently ready to carry out the spirit of the contract if they had not been prevented from doing so by conspiracy (this referring to the refusal of union men to work on the job, with the hope of forcing the contractors to employ union men exclusively on all their work). The decision then says: "This interference by the members of the labor unions with the plaintiffs' work to force the plaintiffs to employ union men only by the means above stated, and by the use of the police to exclude the plaintiffs from the building in which their contract work was to be done, was an unlawful interference with the plaintiffs' rights, and if permitted and continued would, in the language of the Supreme Court in the discussion of a similar question, 'tend to establish a tyranny of irresponsible persons over labor and mechanical business which would be extremely injurious to both.' There is no authority in law for any officer of the government, State, or municipality to force such a discrimination as was attempted in this case between workmen in respect to the privilege of labor on public work paid for by taxes levied upon all, for no reason except that some workmen belong to a certain party, society, or class, and others do not, thus giving labor and the benefit of it to one class and denying it to another regardless of their rights, needs, qualifications, or merits, or the public welfare. Such discrimination in the employment of labor is not in accord with our ideas of equal rights, and seems not to be consistent with an impartial administering of public business, and any agreement that such discrimination shall be made is contrary to public policy, and is, in my opinion, void. The Constitution of Massachusetts declares that 'No man, nor corporation, nor association of men have any other title to obtain advantages or particular or exclusive privileges distinct from those of the community than what arises from the consideration of service rendered to the public" also that 'Government is instituted for the common good . . . not for the profit, honor, or private interest of any one man, family, or class of men.' The right of every man to labor, and the benefit of his labor according to his ability, opportunity, and desire, should not be abridged. The corresponding right of an employer to procure labor suitable for his business, subject only to such general laws as the health, safety, morality, and welfare of the community may require, should be allowed." The remainder of the decision is mainly taken up with a discussion as to the liability for damages, and the ground is taken that as the acts by which the plaintiffs were deprived of their rights were unlawful, they can recover from the defendants as individuals but not as officials. And as a matter of fact, preliminary steps have already been taken to bring suit against the mayor, the architects, and the superintendent of buildings; all of whom were concerned in the controversy. The facts in this particular case are so clearly defined, and the language of the court in the decision granting the injunction is so clear, that little comment is necessary. Probably the decision presents few, if any, new points of law, but it certainly defines with unusual clearness the merits of the case, and a careful reading of the full text of the decision, which was published in most of the daily papers of January 26, should leave little doubt as to the opinion of the Massachusetts courts, at least on the matter of undue or unlawful interference with legitimate business by labor organizations or unions; and also with regard to the right of an architect to say whom a contractor shall or shall not employ, so long as his work is in accordance with the contract and specifications.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK. — The architects of this city have been busier for the past month putting their best work in shape for presentation at the thirteenth annual exhibition of the Architectural League than in work upon actual building undertakings, and perhaps it is just as well that the exhibition occurs during the midwinter month, when building operations are hibernating. It is very gratifying that so much interest is taken in this exhibition, not only by architects and devotees of the allied arts, but by the general public, and every member of the league feels that it is greatly to his advantage to be represented there by his very best work.

A discussion has been begun as to the advisability of holding a great exposition in New York in 1901. Assuming that an exposition would benefit New York, we agree with the *Herald* in that the date mentioned is too soon after the Paris Exposition; and merchants who spend considerable money in making a creditable showing in Paris will scarcely be willing to repeat this expenditure during the year following. If an exposition be held at all, it should be several years later. It is a question whether the New York public will care to consider an undertaking of this magnitude, when the after effects of the Columbian Exposition upon the city of Chicago are borne in mind. The suggestion of ex-Mayor Wurster, of Brooklyn, that the exposition be confined to exhibitors in the city alone, making it strictly a New York exposition, and commensurate with the size and importance of the great city, seems very sensible.

Not only New Yorkers and their immediate neighbors, but all public-spirited Americans should interest themselves in the disgraceful destruction of the Palisades, whose noble cliffs have sheltered the American Rhine since the days of Henry Hudson. In spite of the vigorous protests of the press, no prohibitory legislation can be secured, and day after day the destruction continues, thus bearing out the oft-repeated expression that Americans sacrifice everything for money. This month's *Cosmopolitan* contains an interesting article on the subject, with illustrations showing what a charge of three tons of dynamite effected upon one of the most beautiful spots in our fair land.



TERRA-COTTA DETAIL, RESIDENCE AT CHICAGO.
Shepley, Rutan & Coolidge, Architects.
Executed by the Northwestern Terra-Cotta Co.



DWELLINGS IN NEW YORK CITY.
Frank Miles Day & Bro., Architects.

Another instance of the power of great corporations is shown in the ease with which the trolley companies of Brooklyn gained the right to run their cars over the bridge, taking up most of the space formerly used for vehicles, and crowding the bicyclists off almost entirely, although this means of locomotion to and from business has been rapidly growing in favor.

To the dissatisfaction of many, the new mayor has expressed himself as against the underground rapid transit system, and it now seems further off than ever, in spite of the unsightly appearance of the elevated roads and their accompanying nuisances and dangers.

Among new building projects are: —

A fourteen-story fire-proof building for the Tide Water Building Company, in which the Astors are interested. The building will contain offices and stores, and will cost $850,000. George B. Post is the architect.

The Lord & Burnham Company have filed plans for an horticultural building to be built in Bronx Park, at a cost of $200,000. The building will be constructed of brick, stone, and iron.

Architect Robert Maynicke has drawn plans for a new six-story building to be erected by the Germania Bank, on the northwest corner of Bowery and Spring Streets. Cost, $200,000.

Mr. Solomon Loeb, of Kuhn, Loeb & Co., will erect a seven-story home and office building, which will be presented to the United Hebrew Charities. About $150,000 will be expended.

Architects N. Le Brun & Sons have planned a five-story brick, stone, and terra-cotta building for the Marist Brothers of the Church of St. Jean Baptiste.

The Knickerbocker Realty Improvement Company will erect a twelve-story hotel on the site of the old Fourth Presbyterian Church on 34th Street, near Sixth Avenue.

Architects Babb, Cook & Willard have planned a five-story brick dwelling to be erected on Fifth Avenue, near 88th Street, for Mr. G. H. Penniman. Cost, $65,000.

Architects Child & De Goll are preparing plans for a velodrome similar to the one in Paris, which will soon be erected in New York. The building will be devoted exclusively to bicyclists, and will cost about $250,000.

The New York Metal Exchange will erect a ten-story fire-proof building at the corner of Pearl Street and Burling Slip.

Hill & Turner, architects, are preparing plans for a church for the Washington Heights Dutch Reformed Congregation. Cost, about $125,000.

PHILADELPHIA.— Philadelphia has lately had an example of the phenomenon, probably not unknown in other localities, when a reduction in the amount of work has resulted in an increase in the number of architectural offices. Few of the usually busy architects have been able to hold their full complement of men. Some of these men have thus been tempted to begin practise with small houses or alterations to carry on, which would have been lost in the routine work of the larger offices. And just so have many of our best-known men commenced.

There is just finished at the Northeast corner of 4th and Chestnut Streets a most charming addition to Philadelphia architecture. A two-story bank by Wilson Eyre, Jr., built of Sayresville red brick in Flemish bond, having wide joints of cement, with white marble doorway, string-course and cornice, and slightly pitched copper roof treated so as to show already green. It all seems so natural a bit of colonial architecture that a stranger seeing it in a few years must take it for a well-preserved specimen of the old town. On the interior the colonial idea is faithfully carried out: a yellow plastered barrel vault, cut into at the sides by round-headed windows and recesses opposite, and resting on white painted pilasters with mutuled cornice; even the counters and screens are designed to correspond, in white painted wood relieved only by a few lines of mahogany molding.



ST. CHRISTOPHER'S HOUSE, NEW YORK CITY.
Barney & Chapman, Architects.
Terra-Cotta by Conkling-Armstrong Terra-Cotta Company.

The Annual Architectural Exhibition just closed, conducted by the T Square Club at the Academy of the Fine Arts, has been fully up to the average; some good English work by Colcutt, Shaw & Ernest George, and French work of the students at the Beaux Arts.

Frank Miles Day & Brother showed a rendered elevation and photographs of the lately finished brick and terra-cotta Crozer Building on Chestnut Street, above Broad. Very rich terra-cotta ornament around the tenth story and above, breaking out into pinnacled dormers around a peaked tile roof, gives the building a striking appearance from a distant point of view, for which it has evidently been designed. Cope & Stewardson were largely represented by rendered drawings of current work: Two fronts of dark red brick and light stone, on Walnut Street; the gabled entrance to a country house in English style; also two huge renderings of buildings for the Pennsylvania School for the Blind, at Overbrook. A curious fact about the exhibition is that of the hundred and more practising architects in Philadelphia, only some twenty were represented. It is likely an effort will be made to increase this number largely in future exhibitions.

Real estate at Broad and Chestnut Streets has reached a value little dreamed of a few years ago. Already two corners have their thirteen and fifteen story office buildings, and now a third corner is to have one, this of seventeen stories. It has been designed by Edgar V. Seeler, and is to be built of granite for the first and second stories, to be occupied by the owners of the building, the Real Estate Trust Company; the upper stories of light brick and terra-cotta surmounted by a terra-cotta frieze and cornice. In planning the building considerable extra ingenuity and engineering was required, as a long, narrow strip is to be built and finished before the remaining frontage on Chestnut Street is begun. This gives a problem of wind bracing which would have been much simplified had the whole structure gone up at once.

A twenty-story building from the plans of J. Huston is projected on Broad Street below Chestnut. Huge candelabra, carrying electric lights around the sky line, are a proposed feature of the design.

CINCINNATI.— The year 1897 has been an extremely dull one, and the records of the Building Inspector's office will show that we have done less in proportion to our population than almost any other city west of the mountains.

Up to this time it looks as though the dulness would continue during the coming year, as very little new work is talked about.



TERRA-COTTA DETAIL,
ST. CHRISTOPHER'S HOUSE,
NEW YORK CITY.
Barney & Chapman, Architects.
Executed by the Conkling-Armstrong Terra-Cotta Company.

The Cincinnati Chapter of Architects, under the aggressive leadership of its Secretary, Mr. A. W. Hayward, has awakened from its slumbers and gives promise of becoming useful to the profession and the community. They are now at work upon a revision of our building laws, and are also actively pushing a license law.

Messrs. Samuel Hannaford & Sons have just completed the drawings for the new Pearl Street Market House, and are now taking bids. This covers a space of 47 by 403 ft. It is naturally a very simple building in plan, but will be constructed of good materials, and will be quite elaborately finished with enameled and ornamental brick, with color decorations in friezes, and panels of Mosaic encaustic tile.

Messrs. Des Jardines & Hayward will remodel the old Masonic Temple, transforming it into a modern office building, at a cost of about $100,000. This will be an interesting bit of work, and we imagine, quite a serious problem, as the old story heights and the tremendously heavy construction of the old building renders any change of existing lines rather difficult.

Next year the Golden Jubilee of the North American Saengerfest Association will be held in Cincinnati. The committee in charge of the affair will, within the month, issue a circular to the local architects, inviting competition drawings. The building will be of a temporary character, to cost about $50,000, and the structure will be required to seat about twenty thousand persons, including audience and chorus. It is a pity that this building cannot be made a permanency, as the city needs a large hall of this character for conventions and other large gatherings.

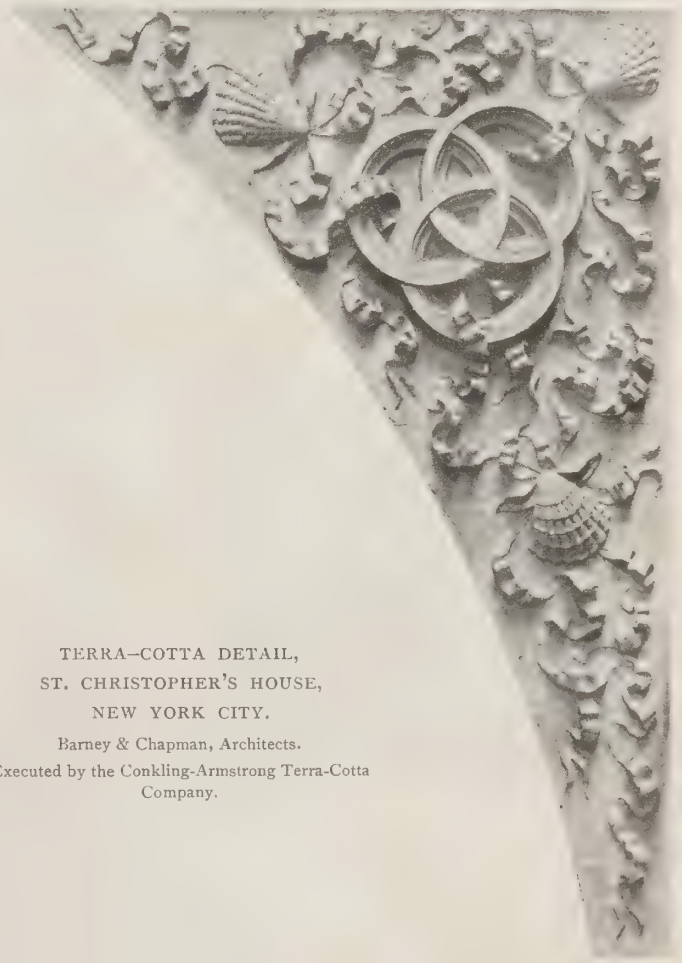
The Cincinnati Edison Electric Light Company have entrusted the work of their new building to Messrs. Elzner & Anderson, who have about finished the drawings. This is an extremely interesting building, and is remarkable for its very heavy steel construction, as the boilers and other heavy loads are carried on the upper floors.

Outside of the work mentioned there is very little in sight. There are a few moderate-priced dwellings on the boards in several of the architects' offices, but in large office and commercial buildings we are wofully lacking.

ST. LOUIS.—The outlook for the coming year is far from being as encouraging as was hoped for. Usually, anticipated work is well under consideration by this time, but there has been little activity in that direction up to the present. The conservative investor has not loosened his purse strings sufficiently to cause much of a ripple in building circles, although there is some satisfaction to be gotten from the report of the Building Commissioner for January, which shows continued improvement in the class of buildings being built.

The past year has the most notable fire record of any in the history of the city. Early in the year the Lionberger Building, a noble work by Richardson, was destroyed, which, with its contents, amounted to a million and a quarter dollar loss; while later the old landmark, the Polytechnic Building, met a similar fate. During the closing month of the year the F. O. Sawyer Paper Company's building, and the Mermod, Jaccard Building were burned. The latter fire occurred on December 19, totally destroying the building, which was occupied as a jewelry store by the above-named firm. The enterprise shown by the firm, which is one of the largest of its kind in the West, was at least unusual, they having by the following morning purchased the entire stock of another firm, and opened for business without an hour's loss of time, the fire being on Sunday morning.

The new year also gives promise of a fire record. On January 8 a portion of the Christian Peper Tobacco Company's warehouse was consumed, entailing a loss of $125,000. The building was six stories, of heavy timber construction. Brick walls divided the building and confined the fire to the one wing. Each of these burned



TERRA-COTTA DETAIL,
ST. CHRISTOPHER'S HOUSE,
NEW YORK CITY.
Barney & Chapman, Architects.
Executed by the Conkling-Armstrong Terra-Cotta Company.

buildings form an interesting study, fully illustrating the necessity of more thorough inspection of buildings and stricter enforcing of the building ordinance.

On January 26 the Union Elevator was burned, causing a loss of $750,000. This was located on the other side of the river, but was a St. Louis enterprise.



HOUSE AT ST. LOUIS.
Barnett, Haynes & Barnett, Architects.
Terra-Cotta executed by the Winkle Terra-Cotta Company. Front Brick furnished by the Hydraulic-Press Brick Company.

St. Xavier's Church, on the corner of Grand and Lindell Streets, has been completed with the exception of the tower, and was dedicated on Sunday, January 16. The building is 212 ft. long by 120 ft. wide, and 66 ft. high in the center of nave. The ceilings are groined, springing from highly polished marble columns. The style is the early English, and it was designed by the late Thomas Walsh, who commenced the building in 1883. Later the plans were revised by Henry Switzer, who had charge of the work until its completion.

The bells which will be placed in the tower when it is completed have a considerable historical interest, having been cast in Spain in 1761. On the night of July 25, 1812, the bells were broken by a shell thrown by the French from the Trocadero, and were later recast.



DETAIL OF ENTRANCE, HOUSE AT ST. LOUIS.
Barnett, Haynes & Barnett, Architects.

Within the last few months St. Louis has lost one of her most prominent firms of architects, Wheeler & McClure having gone to New York.

A movement has been inaugurated by the labor organizations to have an exposition here in 1903, in commemoration of the hundredth anniversary of the Louisiana Purchase.

The Master Builders' Exchange closed their year's work on December 27, with a banquet and the installation of the following officers for the ensuing year: —

President, L. J. Evans; First Vice-President, J. D. FitzGibbons; Second Vice-President, George Ittner; Secretary, C. D. Morley; Treasurer, Adam Baurer; Trustees, Jas. H. Bright and C. Linnenkohl.

At the annual meeting of the St. Louis Architectural Club, on January 8, Mr. Wm. B. Ittner was re-elected President; F. A. P. Burford, First Vice President; H. G. Eastman, Second Vice President; Emile Neiman, Secretary; J. C. Stephens, Treasurer; R. G. Milligan and Benno Jansen, Executive Board.

CHICAGO.— Mention has been previously made of the Illinois State law entitled, "an act to provide for the licensing of architects and regulating the practise of architecture as a profession." Subsequent to Jan. 1, 1898, an architect obtained a license only by passing an examination, or making an "exhibition" to the Board of Examiners, which was considered by them an equivalent.

The first grant of licenses to architects who were not practising when the law was passed resulted in qualifying twelve on examination (one of whom was a woman,) and six on exhibition of their work.



NEW SYNAGOGUE AT TORONTO, ONT.
J. W. Siddall, Architect.

Only one was rejected. It is of interest to note that the man ranking first in this examination had had six years' experience with a contractor, but no technical training aside from that gained in an architect's office. The second in rank, on the contrary, had had an exceptionally extensive education. The woman was the third in rank, and she included in her experience a course at the Boston Institute of Technology, and travel abroad. Some of those ranking lowest had had four years' training in architectural schools.



TERRA–COTTA DETAIL, JEWELERS' EXCHANGE, BOSTON.
Winslow & Wetherell, Architects.
Executed by the Perth Amboy Terra-Cotta Company.

The Chicago building ordinances are undergoing revision, although nothing radical is contemplated. Joseph Downey, contractor and ex-commissioner of public works, is chairman of the revision committee, which includes in its membership real estate and material men, a representative of the Building and Trades Council, and Mr. Shankland, the engineering member of the firm of D. H. Burnham & Co.

Amongst the work of interest announced this month are noted a Jewish synagogue of brick, designed by Mr. Paul Gerhardt; a brick and terra-cotta high school building, by N. S. Patton; alterations to an office building at Lake and La Salle Streets, by D. H. Burnham & Co.; an apartment building by architect Eisendrath; and some important fire-proof manufacturing buildings, by Mr. Fritz Foltz.

Jenney & Mundie are nearly ready to let contracts on the addition to the New York Life Building. Two stories of this structure will be granite, but the other ten stories will be terra-cotta. The floor and partition construction will be hollow tile.



TERRA–COTTA DETAIL, CONVERSE BUILDING, BOSTON.
Winslow & Wetherell, Architects.
Executed by the Excelsior Terra-Cotta Company.

A NEW FORM OF ENAMEL TILING.

THE catalogue of the American Enamel Brick and Tile Company presents, in addition to the ordinary shapes, a form of enamel tiling intended to replace enamel bricks where economy of space and freight charges is necessary. The bricks or tiles are all grooved along the top and bottom edges, the walls of the upper grooving being of even length, while the inner wall of the lower groove is shallower than the outer one. This allows the outer joints to be laid close, at the same time leaving space enough between the outer walls for a nail, which can be driven at any point within the length of the tile, whether the same crosses a horizontal or a vertical joint of the wall behind. In applying these tiles to an upright wall or backing they are built on each other from the bottom or lower part of the wall or backing upward, and as each course is laid the several tiles in the course are nailed to the wall or backing by one or more headed nails, the heads of the nails overlapping the interior of the inner wall of the groove. In bedding the tile the cement seizes the nail and fills the groove, bonding all together into the wall. Screws or shorter nails can be used where these tiles are set as linings over wooden partitions, also economizing materially in space, and, owing to the secure bond between the tiles effected by the cement tongue in the middle groove, it is not necessary to nail each individual tile.



TERRA–COTTA DETAIL, CONVERSE BUILDING, BOSTON.
Winslow & Wetherell, Architects.
Executed by the Excelsior Terra-Cotta Company.

The tiles are made to lay as standard English size brick, namely, 3 in. by 9 in. face, and are made 2 ins. thick. Where economy of space is an object this tile is an excellent device, and for wainscoting of lavatories in wooden houses, where brick nogging is not desired or impracticable, this tile can readily be put in place with combined economy and absolute surety against falling out after the work is finished. Corners and quoins, rebated vertically to fit into the tiles, are manufactured to go with this facing, together with special moldings for top of wainscoting fastened in similar manner.

NATIONAL BRICKMAKERS' CONVENTION.

THE twelfth annual convention of the National Brick Manufacturers' Association was held at Pittsburgh, Pa., Tuesday to Friday, February 15 to 18. It was one of the most successful conventions ever held by the association. These annual gatherings, which are attended by many of the larger clay workers of the country, are productive of a distinct betterment of the burnt-clay industries as a whole. Not only do the workers freely discuss the more important problems connected with the business, but the greater part of the time is given over to the reading of important papers of a technical nature, which are prepared by those well versed in the art of clay working. We doubt if there is another industry in this country where the people interested give more thought and careful attention to the end that their product shall meet the requirements of an exacting market.

CURRENT ITEMS OF INTEREST.

THE Fawcett Ventilated Fire-proof Building Company, James D. Lazell, Boston agent, have completed a vault floor for the Five-Cent Savings Bank, Boston.

THE AMERICAN ENAMELED BRICK AND TILE COMPANY, of New York, have appointed W. G. Weaver, 22 Clinton St., Newark, N. J., their sales agent for the State of New Jersey.

WALDO BROTHERS have secured the contract for furnishing the glazed tiles for walls of Adams Square Station of Subway, Boston. The tiles will be manufactured by the Atwood Faience Company.

GROSS & HORN, 506 West Broadway, New York, have been appointed agents for Samuel H. French & Co., manufacturers of Peerless Mortar Colors, who report a rapidly increasing demand for their product.

THE Brick, Terra-Cotta, and Supply Company, of Corning, N. Y., are furnishing the architectural terra-cotta required for the 119th Street, 89th Street, and 20th Street schools, New York City; C. B. J. Snyder, architect.

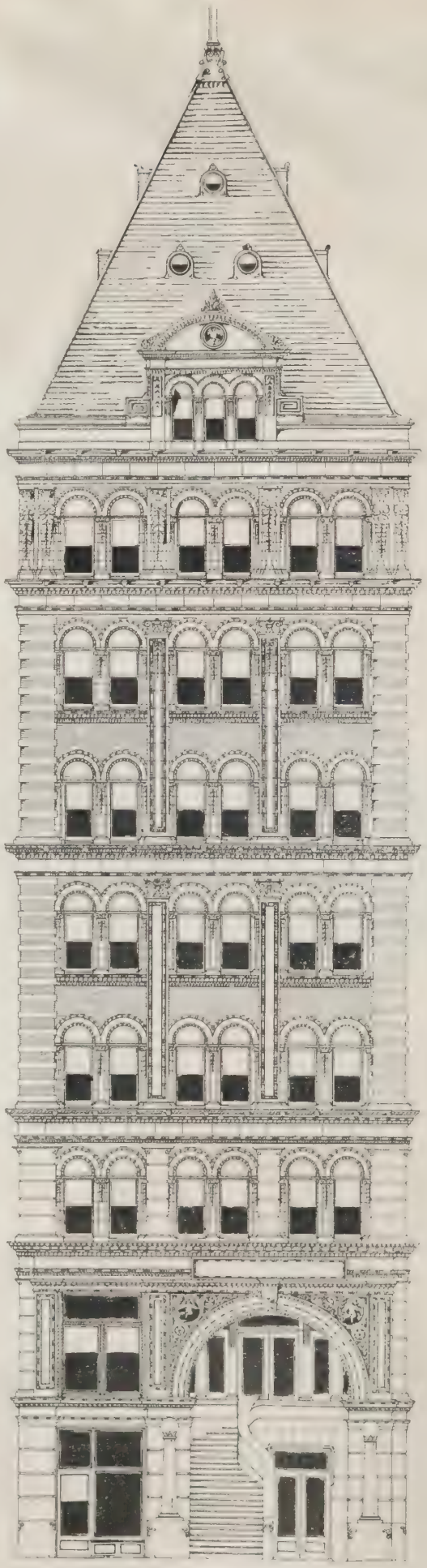
THE Burlington Architectural Terra-Cotta Company are supplying terra-cotta for the new shoe factory being built at Burlington, N. J.; also for a residence at Germantown, Pa., of which H. E. Flower is the architect.

THE name of the Akron Hydraulic-Press Brick Company, of Cleveland, O., has been changed to the Cleveland Hydraulic-Press Brick Company. The management of the company is in no way changed, it being a branch of the Hydraulic-Press Brick Company of St. Louis.

THE Wallace Manufacturing Company, at Frankfort, Ind., have sold since Jan. 1, 1898, nine of their Wonder Brick-making Machines. This is pretty good evidence of two things,— increasing business among the brickmakers, and the popularity of this particular make of a machine.

THE Mason Safety Sidewalk Light is attracting the attention of architects very generally. A good example of its use is shown in front of the Oriental Tea Company, on Court Street, Boston. It has a perfectly level, non-slipping surface, a great desideratum in wet or frosty weather. Its lighting capacity is very large.

PRECIPITATED CARBONATE OF BARYTES, a preventative for scum and discoloration, neutralizing the sulphate of lime in the clay and water, finds a ready demand among those who investigate its merits. Gabriel & Schall, importers, 205 Pearl Street, New York, report a most gratifying growth of this part of their business.



PROPOSED BACHELOR APARTMENT HOTEL, NEW YORK CITY.
Franklin D. Pagan, Architect.

CHARLES E. WILLARD, 171 Devonshire St., Boston, has recently closed the contracts for 150,000 Standard and Norman sized brick for the new building now being erected by the Boston Wharf Company, Boston; M. D. Safford, architect; and 150,000 white brick for the Westminster Chambers, Copley Square, Boston; H. E. Creiger, architect.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., have closed the following new contracts: Steel roof for the Boston Gas Light Company's new building; steel framework, new power house for the American Coffee Company, at Brooklyn; furnishing and erecting a new building, to be known as the Tower Building, for the Benjamin Atha & Illingworth Company, at Harrison, N. J.

THE COLUMBUS BRICK AND TERRA-COTTA COMPANY have supplied their brick on the following new work: Bank building, Columbus, Ohio; L. L. Rankin, architect; residence for W. M. Taylor, Columbus; Yost & Packard, architects; Spahr-Glenn office building, Columbus; D. H. Burnham & Co., architects; Citizens' National Bank Building, Charleston, W. Va.; Yost & Packard, architects; Police Station at Detroit, Mich.; Louis Kamper, architect.

THE C. P. Merwin Brick Company, Berlin, Conn., report the following buildings lately completed, in which their hollow brick were used: Insane ward Connecticut State Prison, First National Bank, Police Station, and Brown Street School, all in Hartford, Conn. They are also furnishing hollow brick for Lowell Block, Worcester, Mass., Cutting, Bardwell & Co., contractors; and both hollow and pallet brick for St. Patrick's Church, Whitinsville, Mass., Chas. D. Maginnis, architect; H. P. Cumming & Co., contractors.

G. R. TWICHELL & Co., 19 Federal St., Boston, report the following recent sales: 150,000 enameled brick for the new building now being erected at South Boston for the Boston Electric Light Company; a large quantity of Ridgway gray Roman brick and Massachusetts wire-cut red brick for the same structure; buff brick for an apartment house at Hartford, Conn.; chocolate-colored brick for a front on Bay State Road, Boston; buff brick for eight new apartment houses at Brookline, Mass.; and a large number of brick for fireplaces for a dormitory at Harvard College.

THE regular annual gathering of general managers of the various branches of the Hydraulic-Press Brick Company was held, as usual, in St. Louis early in February.

The Hydraulic-Press Brick Company, of St. Louis, find it both interesting and profitable to entertain all their general managers once a year; when thus assembled, some twenty or more practical men of experience in the business discuss and advise with each other concerning the various difficult problems connected with modern methods of brickmaking. As these gentlemen represent various plants scattered through nine States of the Union, and producing annually over three hundred million of bricks in endless variety of colors from many different clays, they are each able to furnish valuable suggestions from their various experiences under widely varying conditions. The care, energy, and ability devoted by these gentlemen to the problem of producing at the least cost the high grade of bricks required by modern standards is apparent in the product resulting from their efforts, which may be seen in their exhibit rooms in St. Louis, Kansas City, Omaha, Chicago, Minneapolis, Cleveland, Rochester, Pittsburgh, Baltimore, Washington, Philadelphia, New York, and Boston. They are prepared to offer in any section of the country all the various shades of color in bricks, made from the different varieties of clay throughout the United States.

These meetings, continuing through several days, afford an opportunity for pleasant social intercourse and much pleasant companionship between the gentlemen in charge of the various branches of this widely extended manufacturing business.

A PARTY HAVING SEVERAL YEARS' EXPERIENCE IN SELLING BUILDING SUPPLIES IN NEW ENGLAND, AND WITH AN EXTENSIVE ACQUAINTANCE AMONG THE ARCHITECTS AND CONTRACTORS IN THE NEW ENGLAND TERRITORY, DESIRES TO CONNECT HIMSELF WITH SOME CONCERN DEALING IN GENERAL BUILDING MATERIALS.

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INDEX TO ADVERTISEMENTS.

ADDRESS. PAGE

ACETYLENE GAS GENERATORS.
Napheys Acetylene Gas Generators xxxv
J. B. Colt & Co., 115 Nassau St., New York.

ARCHITECTURAL FAIENCE MANUFACTURERS. (See Clay Manufacturers' Agents.)
Atwood Faience Company, Hartford, Conn. ix
New York Agents, Pfotenhauer & Nesbit, Metropolitan Building, New York City.
The Grueby Faience Company, 164 Devonshire Street, Boston ix
Philadelphia Agent, O. W. Ketcham, 24 So. 7th St.
New York Agent, 287 Fourth Ave.
Chicago Agent, C. T. Harris & Co., Marquette Bldg.

ARCHITECTURAL INSTRUCTION.
Correspondence School of Architecture, Scranton, Pa. xxxvi
Harvard University, Lawrence Scientific School i

ARCHITECTURAL TERRA-COTTA MANUFACTURERS. (See Clay Manfrs.' Agents.)
American Terra-Cotta and Ceramic Company, Marquette Bldg., Chicago, Ill. . x
Brick, Terra-Cotta and Supply Co., Corning, N. Y. xvi
Burlington Architectural Terra-Cotta Co., Burlington, N. J. ii
Conkling-Armstrong Terra-Cotta Company, Builders' Exchange, Philadelphia . v
Excelsior Terra-Cotta Company, 105 East 22d St., New York City . . . iv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Fiske, Homes & Co., 164 Devonshire St., Boston vii
New York Office, Charities Building, 289 4th Ave. Philadelphia Office, 24 South 7th St.
Gladding, McBean & Co., San Francisco, Cal. ii
Indianapolis Terra-Cotta Co., Indianapolis, Ind. viii
New York Architectural Terra-Cotta Company, 38 Park Row, New York City . xxviii
New England Agents, Fiske, Homes & Co., 164 Devonshire St., Boston.
Philadelphia Office, 1341 Arch St.
New Jersey Terra-Cotta Company, 108 Fulton St., New York City . . . viii
Perth Amboy Terra-Cotta Company, New York Office, 160 Fifth Ave. . . vi
Boston Agents, Waldo Bros., 102 Milk St.
Standard Terra-Cotta Company, 287 Fourth Ave., New York City . . . vi
Boston Agents, O. W. Peterson & Co., John Hancock Building.
Philadelphia Agent, W. L. McPherson, Building Exchange.
The Northwestern Terra-Cotta Company, Room 1118, The Rookery, Chicago . x
White Brick and Terra-Cotta Company, 156 Fifth Ave., New York City . . viii
Winkle Terra-Cotta Co., Century Building, St. Louis, Mo. ix

BRICK MANUFACTURERS (Pressed and Ornamental). (See Clay Manfrs.' Agents.)
Brick, Terra-Cotta and Supply Co., Corning, N. Y. xvi
Brush & Schmidt, Office, 2 Builders' Exchange, Buffalo, N. Y. xvii
Conkling-Armstrong Terra-Cotta Company, Builders' Exchange, Philadelphia . v
Columbus Brick and Terra-Cotta Company, Columbus, Ohio xi
Dagus Clay Man'f'g Co., Office, Ridgway, Pa.: Works, Daguscahonda, Pa. . xii
Day Brick Company, Belleville, Ill. ii
Fiske, Homes & Co., 164 Devonshire St., Boston vii
New York Office, 289 Fourth Ave.
Philadelphia Office, 24 So. 7th St.
Gladding, McBean & Co., San Francisco, Cal. ii
Harbison & Walker Co., The. Office, 22d and Railroad Sts., Pittsburg, Pa. . xiii
Hydraulic-Press Brick Co., The xlii
Home Office, Union Trust Building, St. Louis, Mo.
Merwin, C. P. Brick Co., Berlin, Conn. xi
New York and New Jersey Fire-proofing Company, 156 Fifth Ave., New York City. xxi
Ohio Mining and Manufacturing Co.: Office, 41 Wall St., N. Y.; Works, Shawnee, Ohio xiii
Oliphant, Pope & Co., Trenton, N. J. ii
Pennsylvania Buff Brick and Tile Co., Prudential Building, Newark, N. J. . xvi
Pennsylvania Enameled Brick Company, Townsend Building, New York City . xiv
Philadelphia Agent, O. W. Ketcham, Builders' Exchange.
Perth Amboy Terra-Cotta Company, New York Office, 160 Fifth Ave. . . vi
Boston Agents, Waldo Bros., 88 Water Street.
Philadelphia Office, 1044 Drexel Building.
Philadelphia and Boston Face Brick Co., 4 Liberty Sq., Boston 47
Powhatan Clay Manufacturing Company, Richmond, Va. iii
Ralston Brick Co., Ralston, Lycoming Co., Pa. ii
Raritan Hollow and Porous Brick Co., 874 Broadway, New York City . . xvi
Ridgway Press-Brick Co., Ridgway, Pa. xii
New England Agents, G. R. Twichell & Co., 19 Federal St., Boston.
New York Agent, O. D. Person, 160 Fifth Ave.
Sayre & Fisher Co., Jas. R. Sayre, Jr., & Co., Agents, 207 Broadway, New York xv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Tiffany Enameled Brick Company, New Marquette Building, Chicago . . xiv
White Brick and Terra-Cotta Company, 156 Fifth Ave., New York City . . viii
Williamsport Brick Co., Williamsport, Pa. xvi

BRICK MANUFACTURERS (Enameled). (See Clay Manufacturers' Agents.)
American Enameled Brick and Tile Co., 14 East 23d St., New York. xiv
American Terra-Cotta and Ceramic Company, Marquette Bldg., Chicago, Ill. . x
Atwood Faience Company, Hartford, Conn. ix
Fiske, Homes & Co., 164 Devonshire St., Boston vii
New York Office, 289 Fourth Ave. Philadelphia Office, 24 So. 7th St.
Grueby Faience Co., 164 Devonshire St., Boston ix
Hydraulic Press Brick Co., The xlii
Home Office, Union Trust Building, St. Louis, Mo.
Pennsylvania Enameled Brick Company, Townsend Building, New York City . xiv
Raritan Hollow and Porous Brick Co., 874 Broadway, New York City . . xvi
Sayre & Fisher Co., Jas. R. Sayre, Jr., & Co., Agents, 207 Broadway, New York xv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Tiffany Enameled Brick Company, New Marquette Building, Chicago . . xiv

BRICK PRESERVATIVE AND WATER-PROOFING.
Cabot, Samuel, 70 Kilby St., Boston xxxvi
Gabriel & Schall, 205 Pearl St., New York xxxi

BRIDGE AND BUILDING, IRON WORKERS.
Berlin Iron Bridge Co., Berlin, Conn. xxxvii

CEMENTS.
Alpha Cement Company, General Agents, Wm. J. Donaldson & Co., Bourse Building, Philadelphia xxxi
New England Agents, James A. Davis & Co., 92 State St., Boston.
Alsen's Portland Cement, 143 Liberty St., New York City xxxi
Berry & Ferguson, 102 State St., Boston xxxiii
Commercial Wood and Cement Company, Girard Building, Philadelphia, Pa. . xxxii
New York Office, 156 Fifth Avenue.
Cummings Cement Co., Ellicott Square Bldg., Buffalo, N. Y. xxxi
French, Samuel H., & Co., York Avenue, Philadelphia, Pa. xxxii
Gabriel & Schall, 205 Pearl St., New York xxxi
Lawrence Cement Company, No. 1 Broadway, New York City xxxii
Lesley & Trinkle, 22 and 24 So. 15th St., Philadelphia xxxii
Manhattan Concrete Co., 156 Fifth Ave., New York xxxiii

ADDRESS. PAGE

CEMENTS.—*Continued.*
New York & Rosendale Cement Company, 280 Broadway, New York City . xxxii
New England Agents, I. W. Pinkham & Co., 188 Devonshire St., Boston.
James C. Goff, 31-49 Point St., Providence, R. I.
J. S. Noble, 67-69 Lyman St., Springfield, Mass.
Lord Bros. & Co., Portland, Me.
Thiele, E., 78 William St., New York City xxxi
Union Akron Cement Company, 141 Erie St., Buffalo, N. Y. xxxi
Waldo Brothers, 102 Milk St., Boston xix

CEMENT MACHINERY.
Sturtevant Mill Co., Boston xxxiii

CLAY MANUFACTURERS' AGENTS. Brick (Front Enameled and Ornamental), Terra-Cotta, Architectural Faience, Fire-proofing, and Roofing Tiles.
Black, John H., 33 Erie Co. Savings Bk. Bldg., Buffalo, N. Y. xx
Fuller, H. E., & Co., Equitable Bldg., Boston xvi
Ketcham, O. W., Builders' Exchange, Philadelphia iii
Lippincott, E. P., & Co., 24 Builders' Exchange, Baltimore, Md., and 808 F St., N. W., Washington, D. C. xvii
Mayland, H. F., 287 Fourth Ave., New York City iii
Meeker, Carter, Booraem & Co., 14 E. 23d St., New York City xviii
Peterson, O. W., & Co., John Hancock Building, Boston xvii
Twichell, G. R. & Co., 166 Devonshire St., Boston ii
Waldo Brothers, 102 Milk St., Boston xix
Willard, C. E., 171 Devonshire St., Boston xix

CLAYWORKERS' CHEMICALS AND MINERALS.
F. W. Silkman, 231 Pearl St., New York xxvi

CLAYWORKING MACHINERY.
American Clay Working Machinery Co., Bucyrus, Ohio xl
Chambers Bros. Company, Philadelphia, Pa. xl
Chisholm, Boyd & White Company, 57th and Wallace Sts., Chicago . . xl
Eastern Machinery Co., New Haven, Conn. xli
Simpson Brick Press Co., 415 Chamber of Commerce, Chicago, Ill. . . . xli
The F. D. Cummer & Sons Co., Cleveland, Ohio xxxix
The Wallace Manufacturing Co., Frankfort, Ind. xxxix

ELEVATORS.
Eastern Machinery Co., New Haven, Conn. xli
Moore & Wyman, Elevator and Machine Works, Granite St., Boston . . xxxix

ENGINEERS AND CONTRACTORS.
Manhattan Concrete Co., 156 Fifth Ave., New York xxxiii

FIRE-PROOFING MATERIAL MANUFACTURERS. (See Clay Manufacturers' Agents.)
Boston Fire-proofing Co., 166 Devonshire Street, Boston xxii
Central Fireproofing Co., 874 Broadway, New York xx
Empire Fireproofing Co., 1301 Monadnock Block, Chicago xxiv
Fawcett Ventilated Fire-proof Building Co., Bourse Building, Philadelphia . xxiv
Boston Agent, James D. Lazell, 443 Tremont Bldg.
Fiske, Homes & Co., 164 Devonshire St., Boston vi
Gladding, McBean & Co., San Francisco, Cal. ii
Guastavino, R., 9 East 59th St., New York xxii
Boston Office, 444 Albany Street.
Meeker, Carter, Booraem & Co., 14 E. 23d St., New York City xviii
Maurer, Henry, & Son, 420 E. 23d St., New York City xxxiii
New York & New Jersey Fire-proofing Company, 156 Fifth Ave., New York City xxi
Pioneer Fire-proof Construction Co., 1515 Marquette Building, Chicago . . xxi
Pittsburg Terra-Cotta Lumber Company, Carnegie Building, Pittsburg, Pa. . xx
New York Office, Townsend Building, Broadway and 25th Street.
Powhatan Clay Manufacturing Company, Richmond, Va. iii
Standard Fireproofing Co., 41 Cortlandt St., New York xxi

GRANITE.
Gilbreth Seam-Face Granite Co., 85 Water St., Boston xxxiv

MAIL CHUTES.
Cutler Manufacturing Co., Rochester, N. Y. ii

MASONS' SUPPLIES.
Gilbreth Scaffold Co., 85 Water St., Boston xxxviii
Hamblin & Russell Manfg. Co., Worcester, Mass. xxxvi
Waldo Brothers, 102 Milk St., Boston xix

MORTAR COLORS.
Clinton Metallic Paint Company, Clinton, N. Y. xxxiii
French, Samuel H., & Co., Philadelphia, Pa. xxxii

MURESCO.
Moore, Benjamin & Co., Brooklyn, N. Y. xxxv

PRESERVATIVE COATINGS.
Smith, Edw., & Co., 45 Broadway, N. Y. 47

PLUMBING GOODS.
Randolph & Clowes, Waterbury, Conn. xxxv

ROOFING TILES MANUFACTURERS. (See Clay Manufacturers' Agents.)
Chicago Terra-Cotta Roofing and Siding Tile Co., 1122 Marquette Building, Chicago, Ill. xxvi
Harris, Charles T., lessee of The Celadon Terra-Cotta Co., Limited. . . xxvii
Main Office and Factory, Alfred, N. Y.
Chicago Office, Marquette Building.
New York Office, 1120 Presbyterian Building, New York City.

SAFETY TREAD.
The American Mason Safety Tread Co., 40 Water St., Boston xxxvii

SNOW GUARDS.
Folsom Patent Snow Guard, 178 Devonshire St., Boston, Mass. . . . xxxvii
Hamblin & Russell Mfg. Co., Worcester, Mass. xxxvi

VENTILATORS.
Pancoast Ventilator Co., The. 316 Bourse Building, Philadelphia, Pa. . . xxxvi

WALL TIES.
The Cleveland Pat. Steel Wall Ties. Wason, Hamilton, and Dart Sts., Cleveland, Ohio xxxvi
Hamblin & Russell Manfg. Co., Worcester, Mass. xxxvi

WINDOW PULLEYS.
Queen Sash Balance Co., 150 Nassau St., New York xxxi
The Shull Overhead Window Pulley, 178 Devonshire St., Boston. . . . xxxv
100 Park Place, New York.

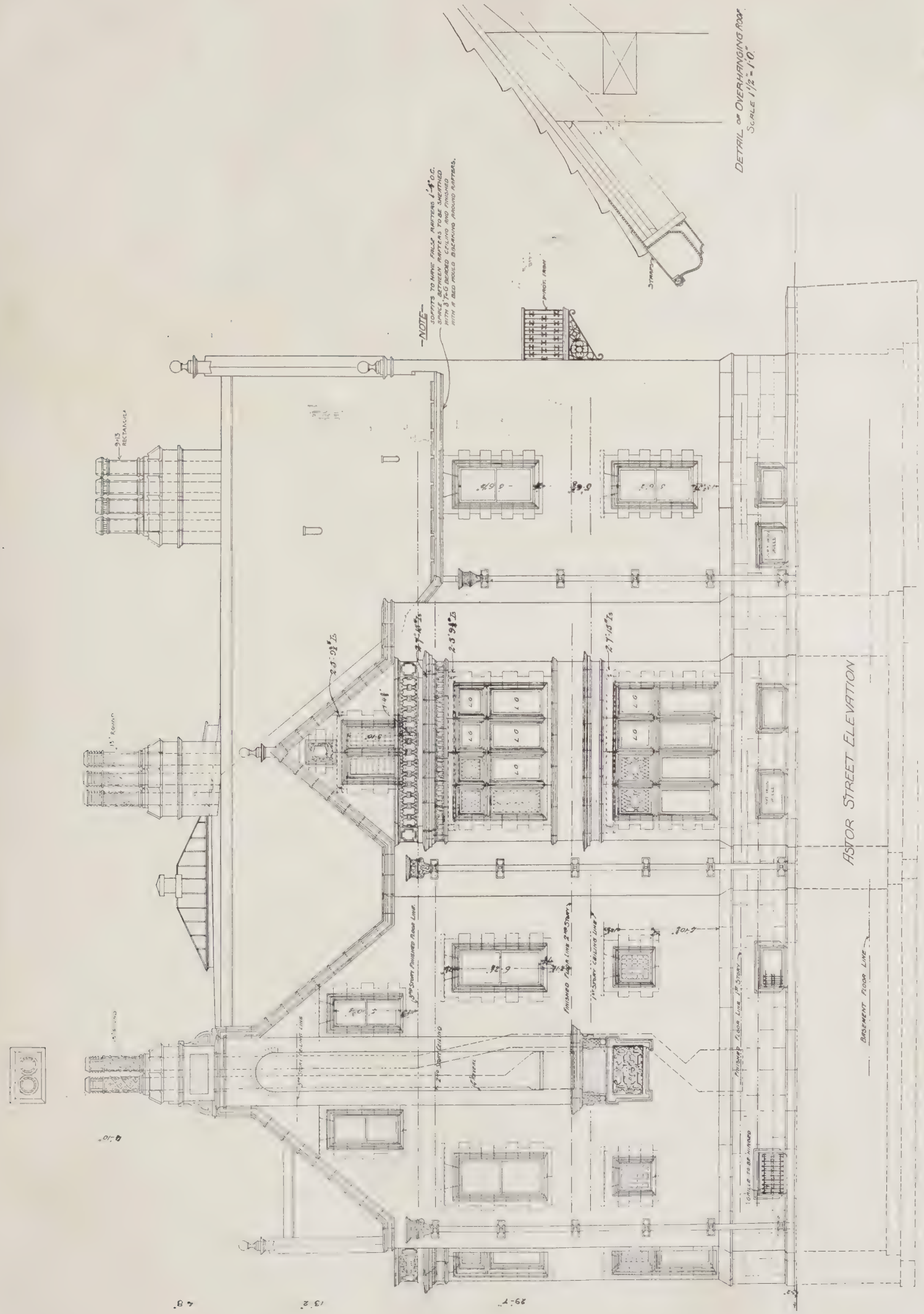


REAR ELEVATION.

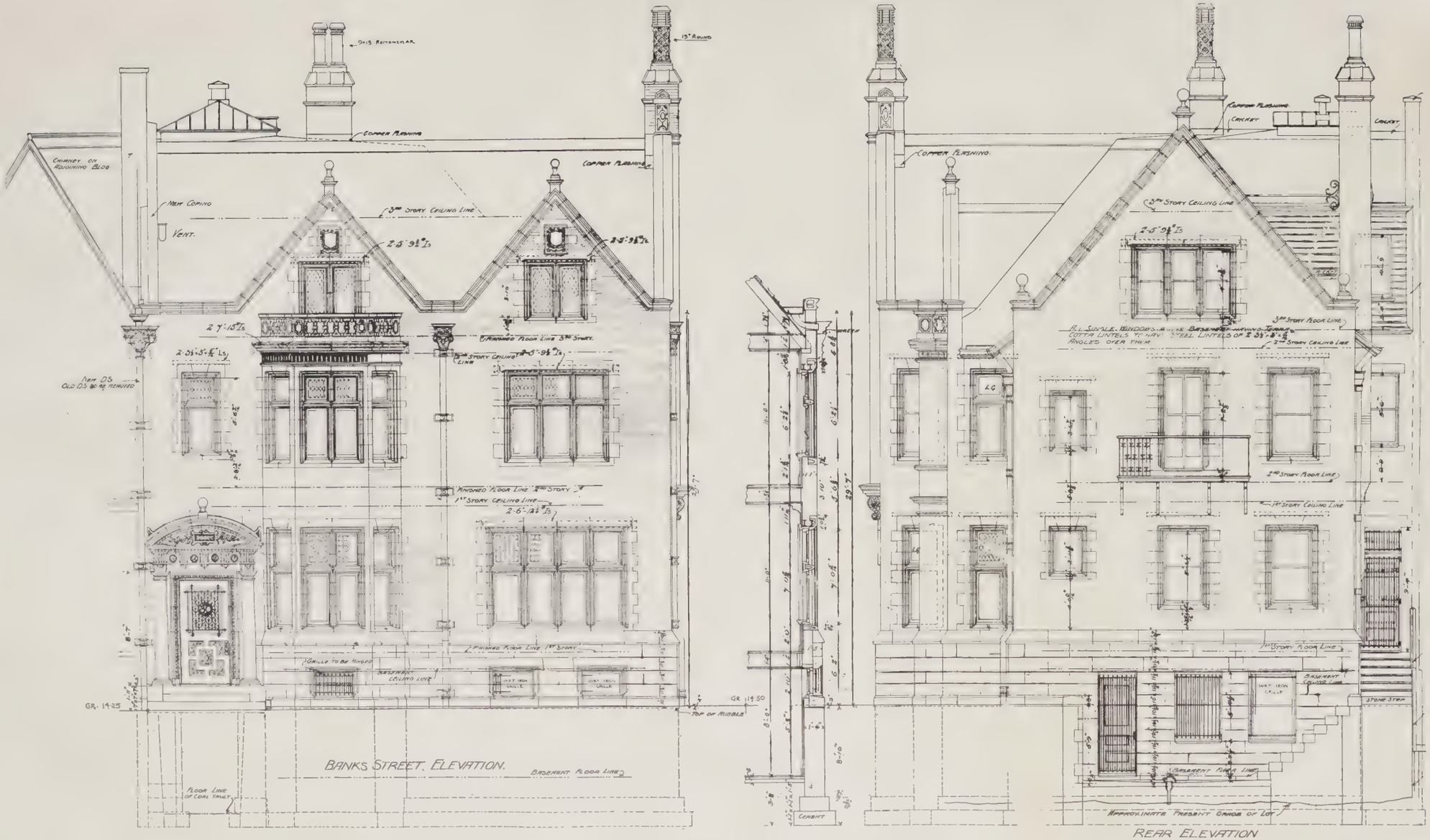
FRONT ELEVATION.

ADMINISTRATION BUILDING, CHICAGO ORPHAN ASYLUM, CHICAGO, ILL.

SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS.



HOUSE AT CHICAGO, ILL.
SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS.

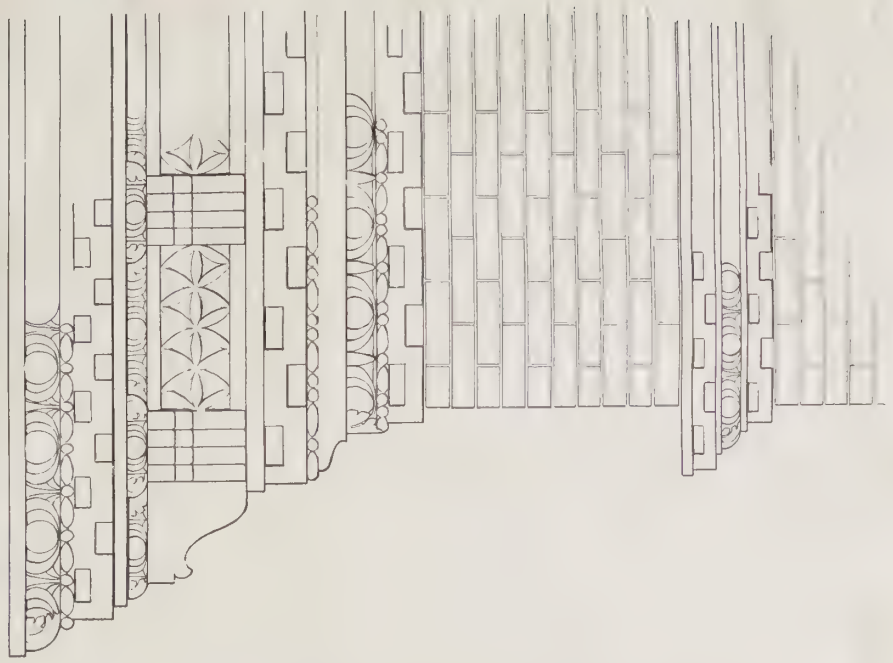


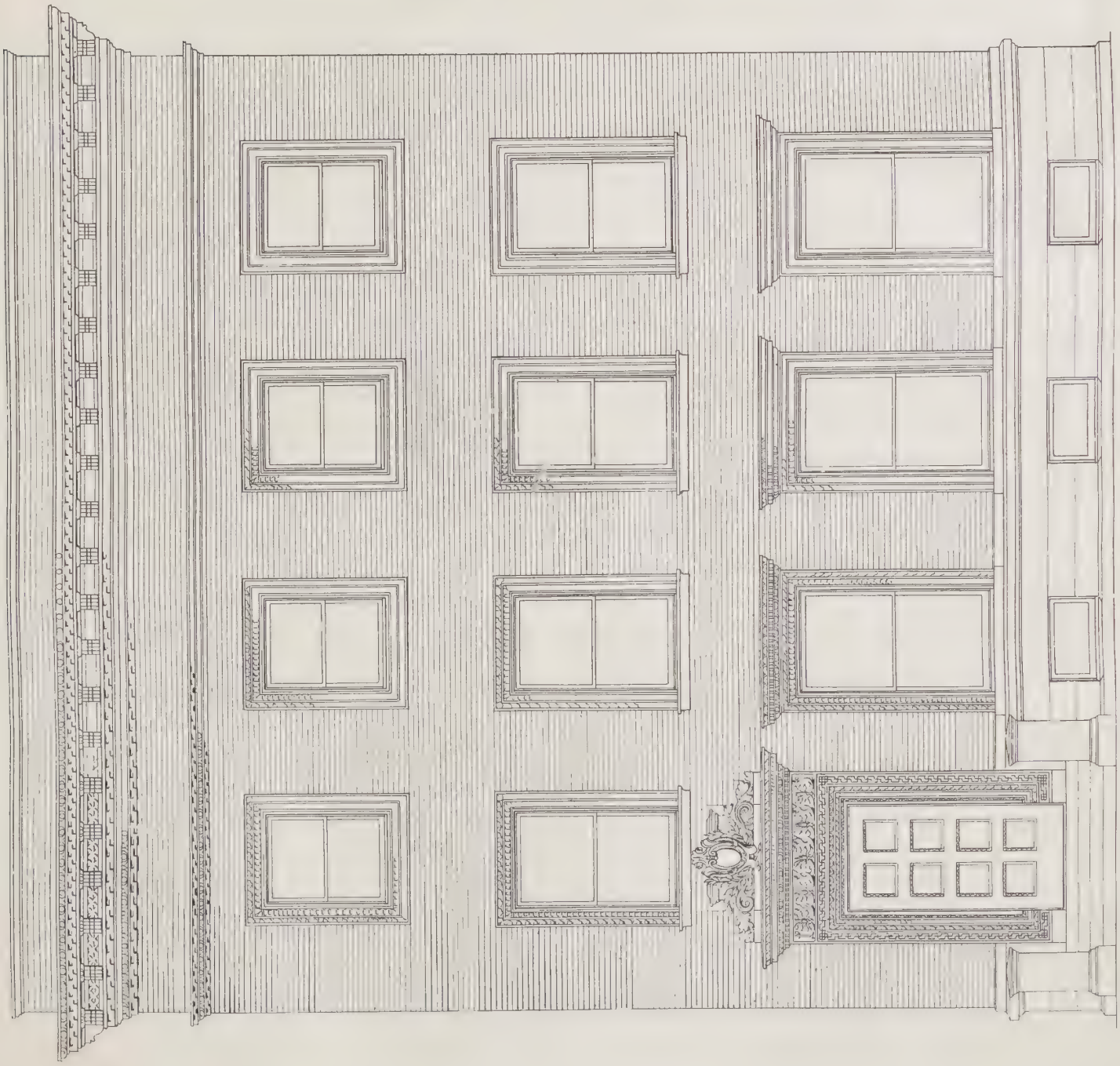
HOUSE AT CHICAGO, ILL.

SHEPLEY RUTAN & COOLIDGE, ARCHITECTS.

BOSTO

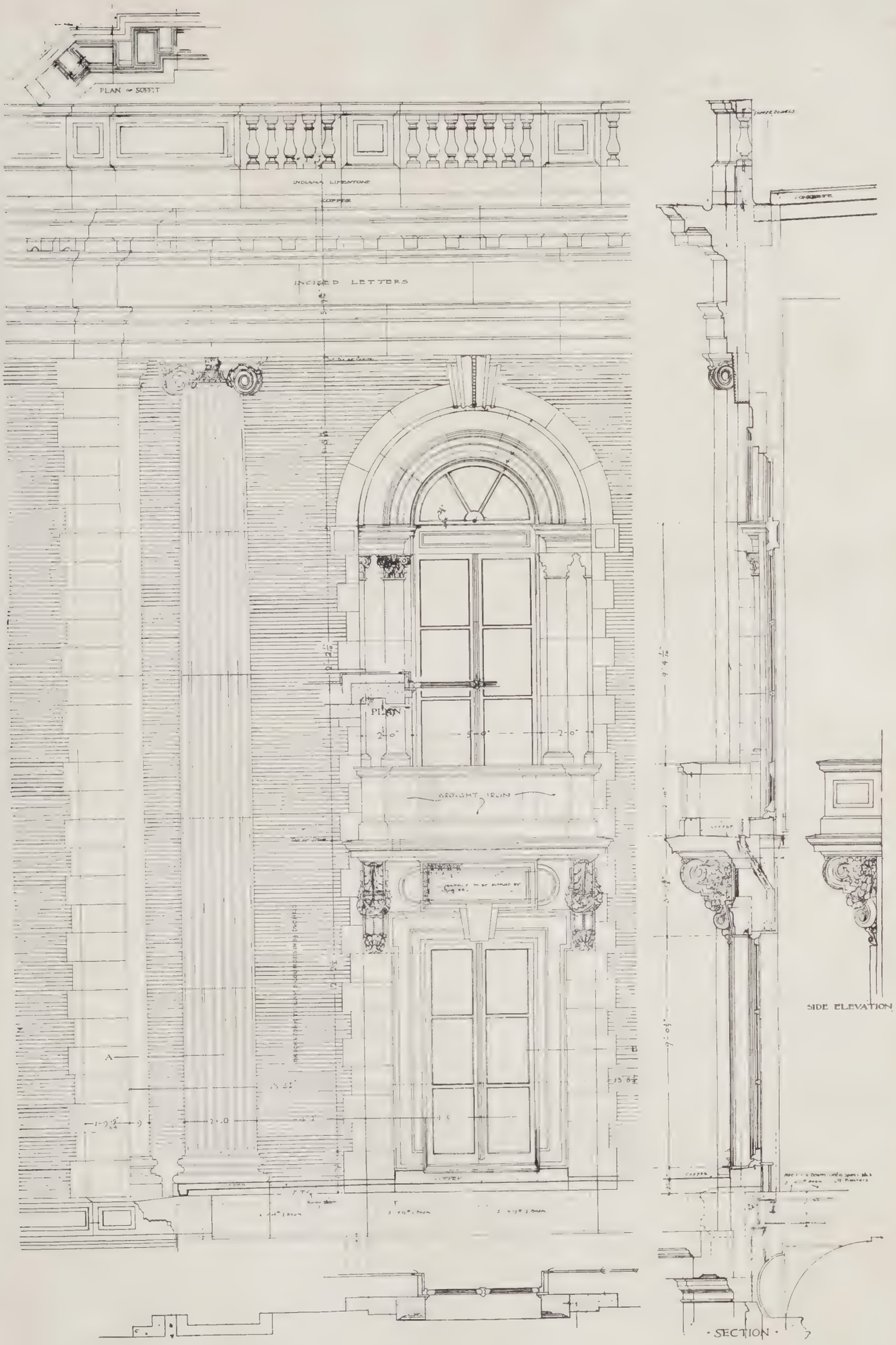






HOUSE AT CHICAGO, ILL.

SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS.



DETAIL OF CENTRAL FEATURE, FRONT ELEVATION.

BUILDING FOR THE MASSACHUSETTS HISTORICAL SOCIETY, BOSTON, MASS.

WHEELWRIGHT & HAVEN, ARCHITECTS.

FENWAY ELEVATION.

FIRST FLOOR PLAN

FRONT ELEVATION.

BUILDING FOR THE MASSACHUSETTS HISTORICAL SOCIETY, BOSTON, MASS.

WHEELWRIGHT & HAVEN, ARCHITECTS.



RESIDENCE OF W. D. HOLLIS CHICAGO.

The Celadon Terra-Cotta Co., Ltd.

CHARLES T. HARRIS, LESSEE.

....Manufacturer of....

Artistic Roofing Tiles.

ALFRED, N. Y.

This cut illustrates the use of our 8 in. Conosera tile and the graduated tower tile; also our terra-cotta hip and ridge roll and finials. See November and January numbers of THE BRICKBUILDER.



HULL MEMORIAL CHAPEL, CHICAGO.

EASTERN OFFICE:

Suite 1123-4 Presbyterian Building,

156 FIFTH AVENUE,

NEW YORK.

This cut illustrates the use of our closed-shingle, as described in the December number of THE BRICKBUILDER.



RESIDENCE OF LEON MANDEL, CHICAGO.

WESTERN OFFICE:

Suite 1001-2 Marquette Building,

204 DEARBORN STREET,

CHICAGO.

This cut illustrates the use of our open-shingle tile, which is of the same character as the closed-shingle, only made with a lip, and laid 200 to the square open, instead of 300 to the square closed.

Boston Representative, CHARLES BACON, 3 Hamilton Place.



THE ASTORIA HOTEL, FIFTH AVENUE AND THIRTY-FOURTH STREET, NEW YORK CITY. H. J. HARDENBERGH, ARCHITECT.

Attention is called to the fact that some 61,000 cu. ft. of terra-cotta are used on this building and the Astor Court Building, seen in the distance. This includes the work made for the interior, on the ground and first floors. The total weight was about 2,200 tons, which is equal to 600 truck loads of 7,333 lbs. each.

ARCHITECTURAL TERRA-COTTA EXECUTED BY

The New York Architectural Terra-Cotta Company,

38 PARK ROW, NEW YORK CITY.

PHILADELPHIA. BOSTON.

VOLVME VII MARCH 1898 No. 3

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

ROGERS & MANSON,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX 3282.

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ENAMELS ON BURNT CLAY.

THERE appeared in *Harper's Weekly*, a short time since, a very interesting account of the artistic porcelain and pottery makers of Japan, from which it appeared that their industry is by no means a thing of the past, but on the contrary exceedingly alive and growing all the while, and that many of the effects, such as the peach blows and the *sang de bœuf*, which have been the despair of modern manufacturers, are imitated so cleverly by the modern Japanese artists that the best connoisseurs are sometimes at fault. Following this article we had occasion to pay a visit to a large tile works in a neighboring city, and were greatly interested and pleased at the results which were there being accomplished, as well as at the similarity of methods and aims which we found as compared with those of the Japanese artists. We doubt if, on the whole, there has ever been a time within the past few centuries when the ceramic arts were in as prosperous and promising a state as they are now; and if we can judge of the future by the past, the United States will in the next one or two decades produce work of a quality which will hold its own not only with the work of our cousins in Germany and England, but with the more imaginative work of the Japanese artists. We have seen bits of porcelain, examples of glazes and enamels, which were thoroughly in the spirit of the Oriental work, and the natural possibilities of our soil are sufficient to satisfy the demands of the most exacting artists.

The difference between our enameled terra-cottas and the delicate work of the Mongolians is one of application and fineness of workmanship rather than of material, and although we do not usually class Canton tea-cups or Imari ware with such prosaic products as enameled bricks, the artistic, decorative, and practical possibilities of the Japanese potter are all implied in the capacity for the production of first-class enamels laid over burnt clay. Our recent national development has been especially promising along these lines and there have been some notable works produced in enameled terra-cottas and glazed bricks which show not only the capabilities of our manufacturers, but appreciation on the part of our architects and constructors of the capabilities of this fascinating material. We call it a fascinating material, for we have yet to know of a designer who has made a serious attempt to use it who has not sooner or later developed a mania for it. The color possibilities are so large and the effects produced thereby are so permanent that there is no other one medium which is on the whole so satisfactory. The designation, enameled brick or terra-cotta, usually suggests to most minds a perfectly bare uninteresting white wall with a glossy slippery surface. Our manufacturers, indeed, take a pride in the purity of the white enamel which has been applied to bricks and terra-cotta, but the palette of the designer in enamels is so large that almost any color effects can be produced, and we have recently seen some examples wherein blues, reddish browns, and greens have been used with very marked success. The stations of the Subway are lined with a very high grade of enameled brick and tile, and for white work they are very successful. A feeling is manifested at times that so long as enameled brick and terra-cotta is given a half-hearted opportunity in back halls, boiler rooms, and lavatories, that is all the manufacturers could reasonably expect; but if there be infused into the design some of the elements which make the Japanese ceramics so fascinating, there is not the slightest reason why such material could not be adapted for some of the best uses. The Reading station in Philadelphia has in one of the large waiting rooms a considerable quantity of most excellently designed and manufactured enameled terra-cotta work in strong colors and carefully elaborated designs. There is a private hotel in Boston in which the vestibule is treated in enameled terra-cottas, one of the earlier examples, but in a limited way quite satisfactory, and interesting in showing what might be done if the public and our designers were educated to a proper use of a certain material. More recently the baptistery of one of our large city churches has been finished throughout in enameled ware, in low relief, with a very successful color treatment. There is, of course, no lack of historical precedent even closer at hand than Japan for applying this material in the choicest work, but we are only beginning to use it understandingly.

We must not think of enameled brick and terra-cotta as a constructive material at all, but rather treat it purely as a finish, as a material which will take the touch of the designer and the sympathetic tones of the colorist, and will hold both for generations after the color of marble or stone have faded entirely away. A handicap which our manufacturers have been under in the past is the extremely limited market for a really first-class product. The English glazed bricks, — and, by the way, we imagine some of our readers would be surprised to know that some of the best English glazed bricks are made by the Hon. Mr. Gladstone, — set the pace in this country for many years, and our manufacturers thought the limit of their skill was reached when they equaled the foreign production. But we can now do better than that. It is not unfair to say that we have a certain measure of the artistic sense which has made the Japanese pot-

teries so famous, and when the public can appreciate more truly what exquisite effects can be produced in enamels and glazes, and how artistic a combination can be made with these materials applied to colored terra-cottas, it will not be necessary to finish our vestibules in mahogany to secure a rich effect, nor will enamel work suggest nothing more interesting than a perfectly uniform creamy white surface. The prime recommendation of terra-cotta was formerly that it was cheap. Now it ranks as the foremost art industry associated with the building trades; and in like manner its companion, enameled and glazed terra-cotta, can become one of the most notable mediums in which the artist can express the subtlest designs and produce the most permanent rich effects. We have always had a great faith in this material, and believe that the time will come when terra-cotta more generally will be enameled or glazed before it is applied to our commercial structures. The enamel will keep its color intact, and if we may judge by examples which have come down to us from the medieval period, there is no limit to the life of even the most delicate tones.

THERE are begun in this issue three articles of more than passing interest. To those familiar with his earlier work on "Masonry Construction," the paper on "The Strength of Brick Masonry," by Ira O. Baker (M. Am. Soc. C. E., Professor of Civil Engineering, University of Illinois), will be a welcome contribution upon this subject. The paper will be concluded in the April number.

"How to Build Fire-proof" forms the basis of an article by Francis C. Moore. As president of the Continental Insurance Company of New York, and delegate of the New York Board of Underwriters to the Board of Examiners of the New York Building Department, Mr. Moore has had exceptional opportunities to observe the efficiency of the various methods intended for fire-proofing, as well as the deficiencies in plans and construction of many of the so-called fire-proof buildings, hence his deductions and recommendations will be found to be of especial interest and value. Mr. Moore's paper will be concluded in the April number.

A paper "On the Saline Efflorescence of Brick, the Causes Leading to It, and the Practical Means of Avoiding Same," by Oscar Gerlach (Ph. D., Berlin), will commend itself to those who have experienced the annoyance which results from this disfigurement of brick wall by the accumulation of efflorescence, or scum, upon the brick. Prof. Edward Orton, Jr. (Department of Ceramics and Clay-working, Ohio State University), endorses this paper by Dr. Gerlach as being of "great practical and scientific value."

The printing of these papers in this number has necessitated the discontinuance of the Mortars and Concrete Department for this month.

PERSONAL AND CLUB NEWS.

ARTHUR CONNELLY, architect, Newark, N. J., has removed his office to 673 Broad Street. Catalogues desired.

ALFRED H. GRANGER, of Granger & Meade, architects, has withdrawn from that firm and removed to Chicago, where he has formed a partnership with Charles S. Frost. Mr. Meade has formed a partnership with Mr. Abram Garfield, under the name of Meade & Garfield, at 731 Garfield Building.

OWING to the death of Mr. Forrest A. Coburn, of Coburn & Barnum, the firm of F. S. Barnum & Company, architects, has been organized, with the following members: Frank S. Barnum, Harry S. Nelson, Albert E. Skeel, Herbert B. Briggs, and Wilbur M. Hall, with offices in the New England Building.

BOHEMIAN NIGHT was observed by the Chicago Architectural Club, Monday, February 28. The entertainment was arranged by Messrs. Richard E. Schmidt, Arthur Heun, Chas. E. Birge, A. G. Zimmerman, Myron H. Hunt, John B. Fischer, Adolph Bernhard, and E. H. Seaman, who served as hosts for the evening.

THE third annual banquet of the Cleveland Architectural Club was held at the Hollenden, January 20. President Herbert B. Briggs was toastmaster, and responses were made by Messrs. J. N. Richardson, Stephen C. Gladwin, Chas. W. Hopkinson, W. Dominick Benes, Louis Rohrheimer, and Starr Cadwallader. A feature was the presence of the ladies.

A REGULAR meeting of the T Square Club was held on Wednesday evening, February 16. The program of the competition for the evening, entitled "The Nucleus of a Town," had been arranged by Mr. Edgar V. Seeler, who led the criticism on the drawings submitted, and spoke in an interesting way on the possibilities of the general planning of cities.

The mentions were awarded as follows: First, Ira E. Hill; second, Arthur S. Brooke; and third, W. P. Trout.

ON Monday evening, February 21, Mr. H. J. Maxwell Grylls spoke on "Roman Architecture," the third paper of the series on the "History of Architecture," at the Museum of Art, Detroit, before a liberally attended and appreciative audience. It was well illustrated by stereopticon views, and drawings by members of the club.

The public are greatly interested in these lectures and take advantage of the opportunities offered.

The next paper will be given, March 7, by Mr. James E. Scripps, on "History of Gothic Architecture."

ILLUSTRATED ADVERTISEMENTS.

FISKE, HOMES & CO., in their advertisement, page vii, illustrate number nine of their series of brick and terra-cotta fireplace mantels.

The new Telephone Building at Cleveland, Ohio, C. F. Schweinfurth, architect, is illustrated in the advertisement of Harbison & Walker Co., page xiii.



PANEL, SCHOOL BUILDING, 108TH STREET AND AMSTERDAM AVENUE, NEW YORK.
C. B. J. Snyder, Architect.
Executed by the New York Architectural Terra-Cotta Company.

Some interesting Chicago buildings roofed with Celadon tiles are shown in the advertisement of the Celadon Terra-cotta Company, Charles T. Harris, lessee, page xxvii.

The American Schoolhouse. V.

BY EDMUND M. WHEELWRIGHT.

IN a pamphlet on "The Construction of Schoolhouses," published in 1895, Mr. Edward Atkinson gives the following "rough and ready computations upon the cost of schoolhouses," constructed upon the principles of "mill construction."

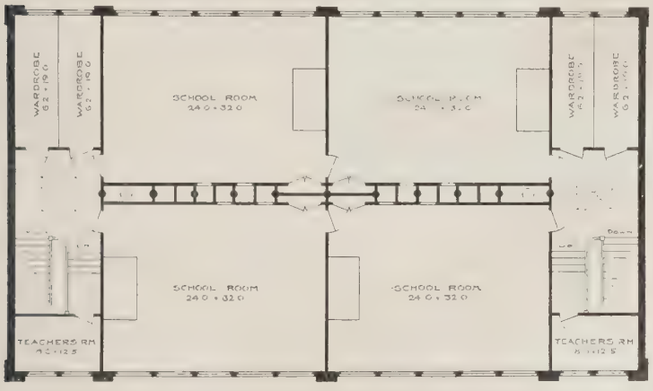
The leading idea of this pamphlet is that schoolhouses are made needlessly expensive on account of expenditure for architectural effect, and that there are conditions of essential economy in so-called "mill construction" which make the use of this method one of radical economy. Careful consideration of the schoolhouse work of several architects and my own experience leads me to a contrary opinion as to both propositions. While there are a few cases to be found where the expenditure for architectural effect on schoolhouses has been somewhat greater than good economy, if not the best taste, would suggest, in the main the increased cost of a pleasing architectural design bears but a very small proportion to the cost of a well-constructed schoolhouse. The elements upon which good effect depends are found in the very conditions of the problem, and with but small expenditure above absolute needs, a skilful designer can bring a satisfactory result. The additional expense mainly comes out of the pocket of the architect, who seeks to give proper proportion and expression to the structure entrusted to him.

As to the greater economy of "mill construction" above that commonly employed, I believe that all who have calculated the cost of the two have found that "mill construction" is slightly more expensive, and has the disadvantage of being troublesome on account of shrinkage of the large-sized stock, and the advantage of being practically safe from danger to the inmates from a fire in the basement.

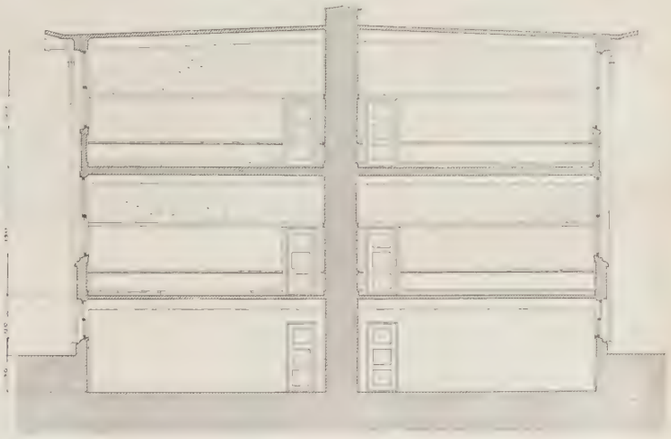
As to the use of thinner brick walls than ordinarily employed, this is not an essential characteristic of "mill construction," and, indeed, the use of 8 in. brick walls is not to be recommended if plastering is to be laid directly thereon as it should be as a fire and vermin precaution. An exposed interior wall, if painted and properly constructed to receive painting, does not make for economy as against a plastered brick wall.

Mr. Atkinson states that "in a broad and general way one may compute the cost of a school building, without plumbing and appliances, midway between the cost of the factory building and the hospital" constructed on the "mill" principle. "That would be $1.35 per square foot of floor, counting all floors.

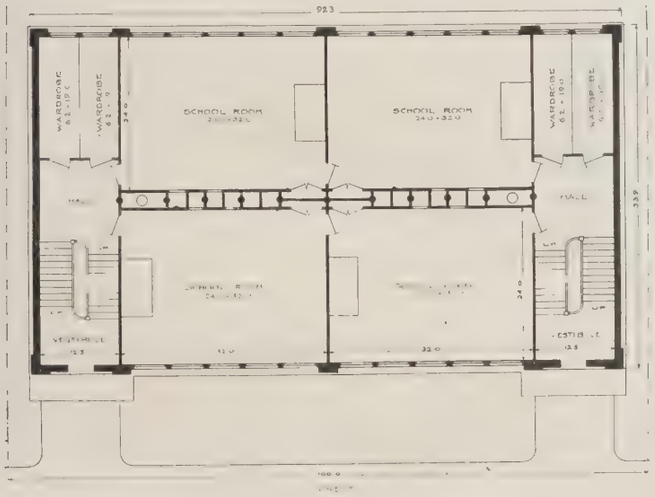
"The schoolhouse of least cost in construction would be one placed on a moderate slope, consisting of basement story and two floors to be occupied by pupils, the main entrance being on the lower side of the slope by a door into the basement, the stairway being wholly within." These conditions are, by the way, not to be considered sufficiently normal to serve as a basis for consideration of cost of a typical schoolhouse, and they have not been strictly followed in the plans of Mr. William Atkinson, here shown, which are published at his request to illustrate the type of building contemplated by his father's pamphlet. The plan described in the pamphlet indicated that of a building with a central entrance, which would have necessitated that the schoolrooms would give off a



SECOND FLOOR PLAN.



SECTIONAL VIEW.



FIRST FLOOR PLAN.



BASEMENT PLAN.

PRIMARY SCHOOLHOUSE.
William Atkinson, Architect.

common corridor and would have required that the two staircases should have been placed in staircase halls at right angles to the main corridor, which is practically the same plan as that shown in the Wyman School. Mr. Atkinson's plan differs in two essential points from the accepted arrangements of our graded schools. First, certain schoolrooms can be reached from others only by passing through a third schoolroom, and all the "wardrobes" are not placed in conjunction with the schoolrooms for whose pupils they are designed.

Each of these variations from accepted conditions are nonconducive to the ready maintenance of order and discipline as well as convenience.

Mr. Atkinson's plan contemplates the use of 12 in. brick walls for first story and 8 in. brick walls for second story. The central floor support by steel columns and girders has the objection of cutting through the heat and ventilation pipes, and of increasing the expense of construction over that given by a brick carrying wall.



EUSTIS STREET PRIMARY SCHOOL, BOSTON.
Edmund M. Wheelwright, City Architect.

"We will assume," says Mr. Atkinson in his pamphlet, "an eight-room schoolhouse in which the pupils are to be provided for on two floors of four rooms each, such schoolrooms to be of the dimensions of 28 by 32 ft. each, for the accommodation of 56 pupils each,— or 448 pupils in all. Four rooms of 28 by 32 ft., 896 sq. ft. each room, would require in all, square feet of floor 3,584

"We find that the minimum of hallway, stairway, teachers' room, and lavatories bears the proportion of 60 per cent. to the space in the schoolrooms on each floor. That would add square feet of floor 2,150

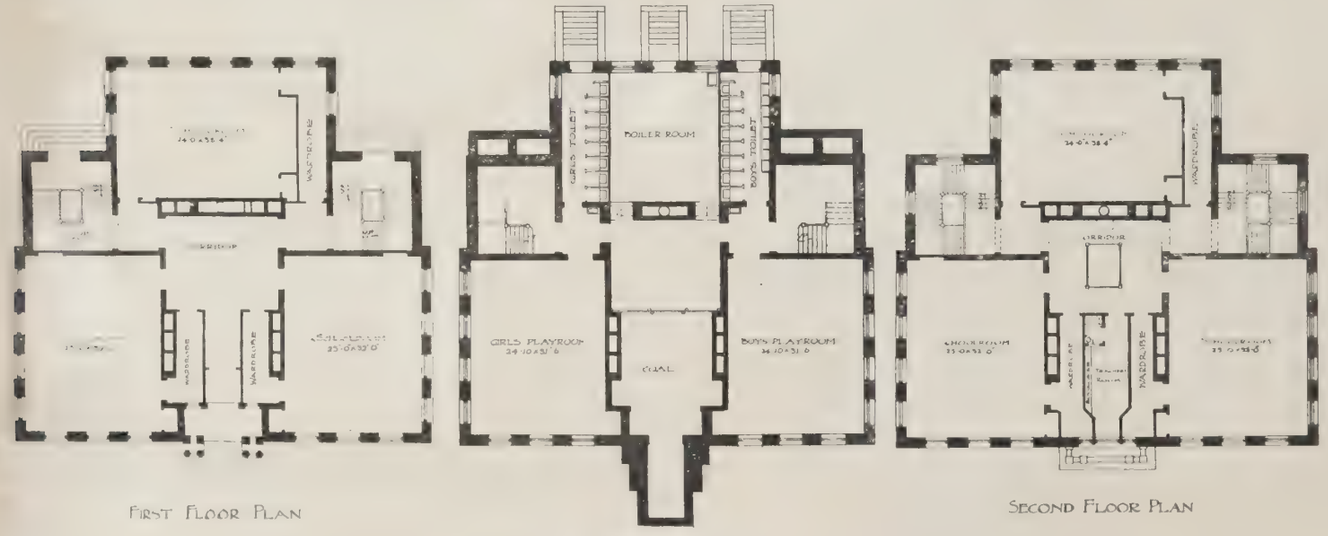
The basement would therefore cover square feet of floor	5,734
First floor	5,734
Second floor	5,734

"We assume that this building is to be covered by what is called a flat roof, that is to say, a roof of ½ in. pitch, without any enclosed space above it. The total floor area, therefore, comes to, square feet of floor 17,202

divided by the number of pupils, this gives 38.56 sq. ft. to each pupil.

"We will add for contingencies and assume that there would be 40 ft. to each pupil in such a building. At the midway ratio between the factory without plumbing and appliances, and the hospital with plumbing, heating, and all appliances, $1.35, this would bring the cost of a brick building of the most substantial kind to $54 per pupil. Multiply by 448 and we get $24,192.

"To this should be added architects' fees, plumbing, heating, ordinary grading, and contingencies. It would seem as if 25 per cent. added should suffice. If so, we reach a total cost of $30,000. In some instances, notably in crowded cities, the size, situation, and neighborhood may make it necessary to arrange the schoolrooms with reference to the sun, and to place hallways and stairways where a larger area than 60 per cent. of each floor will be occupied by them. In that case, the additional number of square feet of floor must be added at the normal rate of cost per square foot. I am unaware whether or not that cost is greatly more or less than the cost of buildings previously constructed to meet a similar want. The only test of these estimates is that plans and specifications should be made upon these lines for submission to any one of the thoroughly competent builders who will not scrimp the work or vary from the highest standard in every respect. My judgment is that this estimate can be attained in practise in the city of Boston, subject to such additional expense as may be imposed by compliance with the building act."



FIRST FLOOR PLAN

BASEMENT PLAN

SECOND FLOOR PLAN

EUSTIS STREET PRIMARY SCHOOL, BOSTON.

It will be noted that the dimensions of the schoolrooms shown in the plan here published are 24 by 32 ft., and not 28 by 32 ft., as premised in the pamphlet; but, as the architect writes me, if the size of the rooms were thus increased in the plans under consideration, the total floor area of all floors, including walls, would be about that given in the pamphlet, *i. e.*, 17,202 sq. ft.

Mr. Atkinson is of the opinion that such a structure as that contemplated by his plan, but with rooms of the larger size, can be constructed outside of Boston, not including plumbing and heating, for about $1.39 per square foot of floor area. He would use iron staircases, slate blackboards, fire-stops and expanded metal partitions, and wire-lathed ceilings. Aside from the excess of cost of requirements of the Boston Building Laws previous to 1892, the school would differ little in its features from those of Boston schoolhouses built about that time. The only points of such difference would be single instead of double sash, wood instead of cement and plaster finish, ordinary base in place of hospital base; for all the Boston schoolhouses built at this time had "mill-constructed" first floors.



WYMAN STREET PRIMARY SCHOOL, BOSTON.
Edmund M. Wheelwright, City Architect.

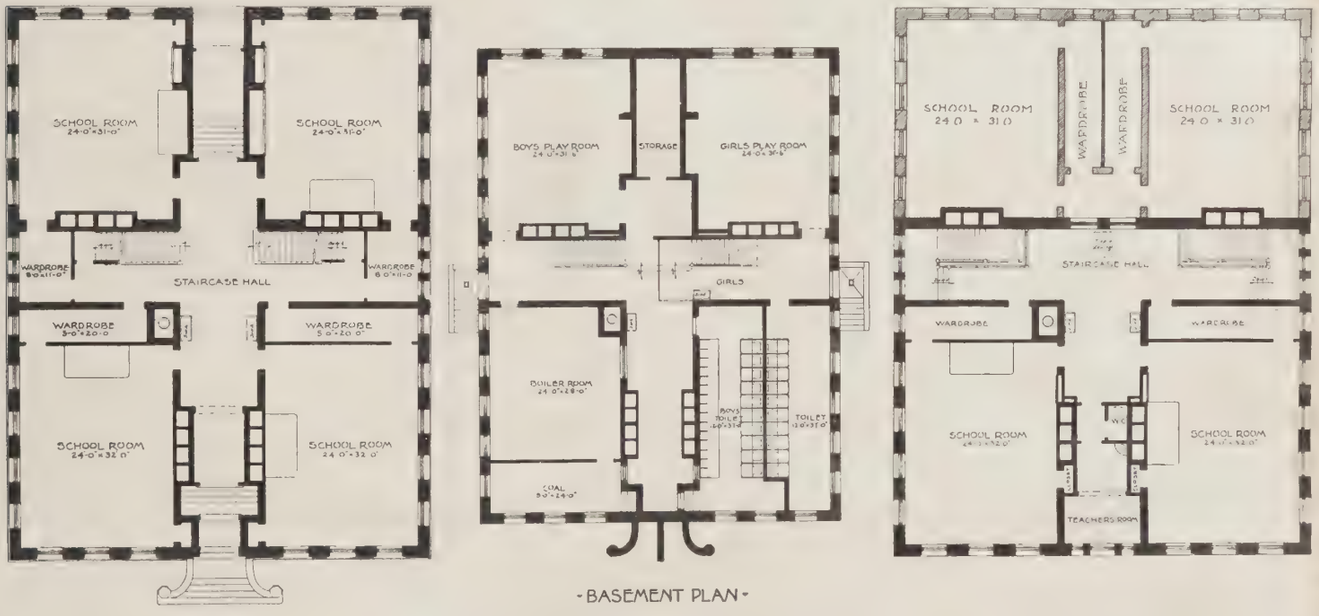
Such being the case, it is difficult to see how Mr. Atkinson's expectations of cost can be borne out in an actual construction of such a building as he has planned. As this building he suggests is of a very unusual and not normal form of schoolhouse plan, it would appear more fruitful of satisfactory result to consider first the cost of an eight-room schoolhouse of a more normal type.

Let us then consider the cost of the Wyman School built in 1891 and 1892 in Boston. It is a building of very simple type, with mill-constructed first floor, flat tar and gravel roof, and of such slight architectural pretensions as to bring it very close to the category of a factory building. It is a six-room building, but, planned for the ready addition of two more schoolrooms, the additional cost of such further construction, if done at the time of the first construction, would have been, say, $2,000 additional to the actual cost, or about $30,000. Mr. Atkinson's estimate of $1.35 per square foot of floor area did not contemplate the cost of heating and plumbing. These features of the Wyman School cost about $3,200, making the cost under consideration about $35,000.

The floor area of the Wyman computed as an eight-room school was 15,744 sq. ft.; its cost per square foot of floor area without heating or plumbing was, therefore, about $2.27.

If this building had been built for grammar grade, with schoolrooms 28 by 32 ft. instead of 24 by 32 ft., its cost would have been increased about $1,500, or about 10 cents per square foot, that is, to $2.37 as against $1.35, the price set by Mr. Atkinson as the price for his mill-constructed school of this type.

The heavier brick walls required in the Boston school above that of the mill-constructed school involved an increased expenditure of about $2,200; the cost of asphalt floor above concrete, double instead of single sash, and other items of more expensive finish, involved not more than $1,800 in addition; and if the slight departures from the strict requirements of necessity in external features



- FIRST FLOOR PLAN -

- BASEMENT PLAN -

- SECOND FLOOR PLAN -

WYMAN STREET PRIMARY SCHOOL, BOSTON.

did not amount to more than $700, I am safe in saying that no saving would have been made if columns and girders had been substituted for brick carrying partitions, but possibly $1,500 might have been saved by not using brick vent and heat flues, and some of the non-carrying brick walls.

About $6,200 is all the saving that would appear if the building had been constructed under building laws that would have permitted the construction upon which Mr. Atkinson bases his calculations.

The area of an eight-room grammar school building, on the same plan as the Wyman School, would have been about 18,000 sq. ft. If a building of this plan were constructed as Mr. Atkinson suggests, we would expect its cost to be about $31,500, or, $1.75 per square foot of floor area. I cannot, judging from my own experience in the cost of actual construction, believe it possible to reach the low cost of $1.37 per square foot of floor area given in the pamphlet.



NORTH BRIGHTON GRAMMAR SCHOOL, BOSTON.
Edmund M. Wheelwright, City Architect.

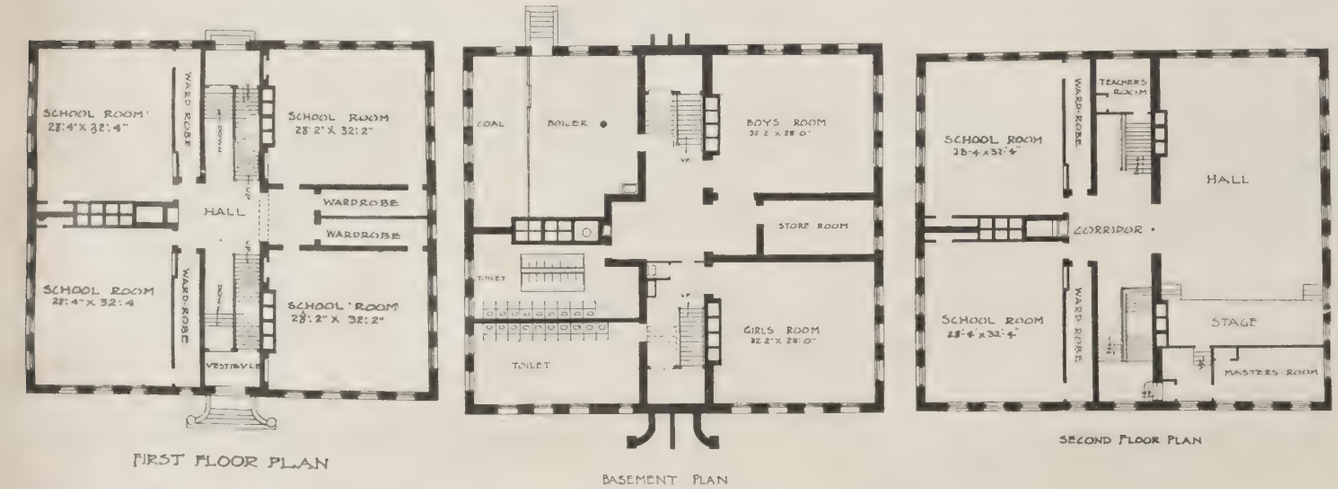
Let us consider another Boston schoolhouse of very plain external treatment,— built at the same time as the Wyman School,— the Warren Grammar School. As this is a six-room building with an Exhibition Hall, it is practically the equivalent of an eight-room building. This building contains 18,648 sq. ft. of floor area, and cost, exclusive of heating and plumbing, about $35,000. It is even plainer in design than the Wyman School, and if the deductions on account of extra thickness of walls and other variants from Mr. Atkinson's hypothetical school are made, we may set the minimum cost of such a building at about $30,500, or about $1.64 per square foot of floor area.

This could again go to show that such low cost of schoolhouse construction as calculated in the pamphlet and by the estimate of the schoolhouse indicated by Mr. Wm. Atkinson's sketch plan is impossible, even if other than "thoroughly competent builders, who will not scrimp the work or vary from the highest standard in every respect," are employed. There is an evident fallacy in the method of striking the mean between the cost of a factory and the cost of a hospital as the basis of cost of a schoolhouse. There are no such elements of a greater cost in a hospital above that of a schoolhouse which would justify such a basis of computation; indeed, the greater floor spans required in a schoolhouse make this class of building little if any more expensive than a hospital of the same grade of workmanship and architectural (or non-architectural) treatment. In my own experience I have found but little difference of cost in schoolhouse and hospital construction.

In a schoolhouse expense for fire protection and for hygienic reasons is equally if not more necessary than in a hospital. The expense of blackboards fully offsets the expense of marble fittings in the ordinary operating room.

The cost of $1.64 per square foot of floor, is, I believe, the minimum cost at which a small grammar schoolhouse, two stories in height, can be built, if constructed as contemplated by Mr. Atkinson's plan. Any departure from the regularity of this plan, or the addition of any of the desirable features not contemplated therein, will make an additional cost.

It should be borne in mind that this cost does not include heating or plumbing. These items will add about 22 cents to the cost per floor area; and the cost of the double sash, with the thicker walls necessitated thereby, asphalt floors and other features requisite for a schoolhouse of the first class, will add 10 cents additional. We may, therefore, set the minimum cost of an eight-room schoolhouse built in a first-class manner, with all features desirable for health of pupils and permanency of construction, and with no architectural pretension, at $1.96 per square foot of floor area, if the building



NORTH BRIGHTON GRAMMAR SCHOOL, BOSTON.

is of as compact a plan as the Warren School; and that as the area is increased in meeting the same conditions, that the cost is increased by about $1 a square foot of such added floor area.

Let us apply this method of estimating to a building of the area of the school predicated in the pamphlet.

The Warren School had 18,648 sq. ft. of floor area, which, at $1.96, amounts to $36,550. The Warren School has more floor area than the school described in pamphlet by about 1,500 sq. ft., which, at $1 per square foot, would decrease the probable cost of such a building to $35,000; the cost of grading, paving, and fencing the schoolyard of such a building would probably not be less than $3,500. The architects' commission would be $1,925, making a probable total cost of first-class, well-constructed, eight-room grammar school not less than $40,425, and which, if shorn of certain desirable features not contemplated in Mr. Atkinson's program, could not cost much less than $38,000, instead of $30,000, which is stated in the pamphlet to be the probable cost of such a building. I regret that further communication received from Mr. William Atkinson cannot be printed in this issue, but it will be given in the next paper.

It has appeared desirable to analyze this subject for two reasons: First, to, if possible, lessen the number of adherents to the idea that the expense of schoolhouse construction is greatly increased through regard for architectural appearance, which appears to be the main point which Mr. Atkinson has sought to establish; and, secondly, to remove the impression which this pamphlet has produced upon the minds of some, that thoroughly appointed and well-constructed schoolhouses are extravagant in cost, because they are found not to tally with the calculations there found. The question of the amount of cost due to architectural design in schoolhouses and the general artistic views of this subject will be later considered.

To follow out further this consideration of schoolhouse costs, the following table relating to a six-room schoolhouse built in Boston under the Building Laws of 1892 is given. The increased size of building due to these laws will be noted, in comparing the plans of the Eustis and Fuller Schools, to be due to the requirement of the later law that staircases should be enclosed and shut off by tinned fire doors.

Three items here given show the excess of cost of method of construction and features in Boston schools of that time above those of schools outside of that city.

Greater thickness brick walls	$1,173.00
Increase through special requirements of law as in relation to enclosed staircases, etc.	1,500.00
Floor framing to carry load of 150 instead of 80 lbs.	1,000.00
Iron above wood staircases	468.00
Fire-proofing of floor and fire-stops	300.00
	$4,441.00

Wardrobes in separate rooms	$1,600.00
Double instead of single run of sash	420.00
Asphalt instead of cement basement floors	500.00
Fire-proof instead of stud partitions	121.00
Wire-lathed instead of wood-lathed ceilings	296.00
Slate instead of composition blackboard	209.00
Keene's cement finish instead of wood	96.00
Hospital instead of common base	106.00
Bookcases and other special finishings	180.00
	$3,528.00

These tables will be found useful in comparing the costs of different schools, but in such use it should be borne in mind that costs of schoolhouses vary on account of the number of schoolrooms, and also whether built for primary or grammar grades. This will be pointed out in detail later and an attempt will be made to fix certain proportions by which calculations may be made from one grade to another and from smaller to larger buildings, and *vice versa*.

Architectural Terra-Cotta.

BY THOMAS CUSACK.

COOPERATION BETWEEN ARCHITECT, ENGINEER, AND CLAY WORKER.

IT has already been assumed, as a matter of course, that the first step towards the erection of a building is to employ a competent architect; not only to plan, but to supervise its erection. If the building is one on which structural iron (or steel) is to be used, he will require the help of an equally competent engineer. There are many ways in which such help may be obtained, but the usual course of procedure resolves itself into a choice between three alternatives. First, he may associate with himself a consulting engineer of repute, who takes charge of the constructural ironwork, and for which service is paid a separate commission. Second, he may employ competent help of this kind to work in his own office at fixed salaries. Third, he may arrange with a capable, trustworthy firm of contracting engineers, who will devise a scheme of construction; for which, as well as for the execution thereof, they will hold themselves responsible, subject to agreement as to cost.

On the relative merits of these three systems a divergence of opinion may reasonably be expected; but as the terra-cotta man is sure to have enough troubles of his own, he had better ask to be excused from any part in a question that does not directly concern him. He is not called upon for advice in regard to the steel structure as such, except in so far as his own work is likely to be affected; and in that it is mechanical rather than business methods that he is forced to consider. Forced, we say, for a stage has now been reached where the settlement of these points is to him and his work a matter of vital importance. It often happens that they have been settled *for* him; sometimes, indeed, before he has obtained the contract for his part of the work, or, at all events, before he has seen the details or has had time to make any recommendations concerning them. If settled in this way, the chances are that the best possible solution has not been thought of, because the man best qualified to render needful assistance, by reason of his special knowledge and experience, has not been consulted. In this we do not impute intentional discourtesy to either architect or engineer; nor do we charge them with any desire to discount the claims, much less ignore the existence of a terra-cotta maker. As a general rule, the facts warrant a distinctly opposite conclusion. It is the *system* under which contracts are usually awarded that is responsible for most of the anomalies that arise in the course of their fulfilment.

Instead of the terra-cotta being one of the first items pushed forward to a definite settlement, it is often allowed to drag until nearly the last, or until some general contractor can make satisfactory terms with one out of many subcontractors. Meanwhile, the iron construction has been determined, and is then, perhaps, too far advanced at the works to admit of any modification being made, however freely certain oversights may be admitted. They may be too palpable to be denied, but these admissions are valueless when accompanied by a statement to the effect that "the shop drawings are all out," or that "the holes have been punched at the mill," and so cannot be altered except at an expense to somebody, which nobody is willing to defray. The terra-cotta manufacturer is usually thereupon advised to do the best he can under these untoward conditions, and with that consolation is expected to rest and be thankful. In all instances of this kind he becomes a scapegoat on whose back a multitude of sins are carried into the wilderness of forgetfulness, while the iron construction, however much at fault, is allowed to pass unimpugned, as though a thing of divine origin.

There are at least two ways in which these grievances may be remedied, or — which would be better — rendered non-existent. The points of contact between iron and terra-cotta might be reserved, and held subject to revision until such time as the successful bidder has had an opportunity of assenting to, or of offering a substitute in lieu

of the proposed arrangement. The better plan, however, and we are glad to say one frequently adopted by the best architects, is to give out the contract for terra-cotta direct, and at the earliest possible date. If, for business reasons, all payments be made through the general contractor, it is a very simple matter to have that item included in his contract. Much remains to be said on this branch of the subject, but to avoid a confusion of ideas, it is reserved for another chapter.

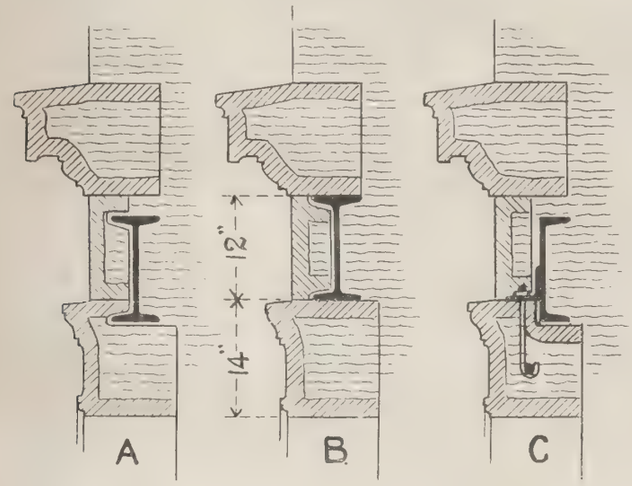


FIG. 50.

The questions at issue may be further elucidated by the few simple illustrations now added to those already given. If, for example, an I beam should be placed arbitrarily as at A, Fig. 50, provision would have to be made in the blocks forming lintel to receive the lower flange. To do so, however, would at once render the blocks more difficult to make, without adding any equivalent support to the lintel. In such a case the I beam should be raised, or the lintel lowered to position shown at B, thus allowing the cornice course to rest directly on beam, the fascia being molded to fit in between the flanges. If, for any reason, the relative positions of I beam and of lintel could not be altered, then a channel might be substituted, and on it an L riveted at any desired height, as at C. A lintel of this kind would be considered self-supporting up to 4 ft., beyond which width of aperture it could be suspended by hangers, inserted in the manner indicated in section, and elsewhere explained with sufficient detail.

Another objectionable arrangement is shown at A, Fig. 51, and in it, too, the remedy is, we think, equally obvious. Just why that 12 in. I beam should have been placed in its present position it is rather difficult to imagine. It cannot be supposed that a beam of that size was necessary to carry the wall above, there being but a few feet of brickwork between it and the sills of a similar tier of windows in the next story. Ostensibly it is intended as a support for the terra-cotta lintels; in reality it reduces these lintels to a shell, rendering them liable to snap along the chase made for bottom flange; manifestly the line of least resistance. Had the engineer's intention been to rob these lintels of their own inherent strength, and at the same time cause the maker of them the utmost inconvenience, he could hardly have hit upon a readier means of doing both. The truth is, he had not mastered the rudiments of the business in which he was engaged; or, having done so, acted with selfish indifference as to consequences.

The change which we would advise in all cases of this kind is shown at B. An arch lintel 14 ins. deep and 16 ins. reveal would be quite safe over an opening of 5 ft., without any auxiliary support. Beyond that width, instead of a 12 in., we would use two 6 in. I beams, placed so as to carry the brickwork above and relieve the lintel below. It is rarely necessary to insert the flange of cast or of rolled sections, and it is better to avoid doing so wherever possible, except at a joint, where it can come between two courses.

An equally objectionable use of iron is illustrated at C, Fig. 51, where a 12 in. I beam is placed so that the flange cuts into back of panel to within 2 ins. of the face. Had this beam been reduced to 8 ins., the flange could then have come into the joint, and so would not have impaired the stability of the panel. This panel, it will be observed, could not be jointed to suit the flange because of the ornament on its face, which would thereby have been mutilated beyond redemption. If, however, a 12 in. beam *had* to be used, for some structural reason not apparent in this section, it could have been placed at least 2 ins. further back, thus increasing the thickness of panel to 4 ins. at its weakest point; in which case the existence of the beam would have been less mischievous.

We can recall an instance of this kind in which the opposite course was adopted by the contracting engineer, and that, too, without any notice being given to the terra-cotta makers, whose work had been made to the original detail. Instead of moving it further back, he actually brought it 2 ins. farther out, without the least regard to the fact that the flange would then come clear through the terra-cotta panel. This, of course, was seen to be quite impracticable, but not until the work was being set; and then an expedient had to be resorted to which was not only expensive, but very unsatisfactory. Whether this unwarranted change was made in ignorance, or from sheer perversity, we know not. Perhaps he suffered from an overweening desire to get the center of beam into the center of column, and so be able to save a little by using standard connections. The excuse is certainly a lame one, but it is the best we can offer on his behalf.

At Fig. 52 we illustrate the design of a conventional balcony, such as might be projected from a second or third story window by way of embellishment. The manner in which it was constructed is likewise shown in section below; in this instance, as an example of how not to do it. In the first place, the cantilevers were of a strength out of all proportion to the load that could, by any possibility, be put upon them. They were placed about 7 ins. too high, cutting through the top bed of modillions and into the bottom bed of the blocks forming platform, thereby causing an incurable weakness in

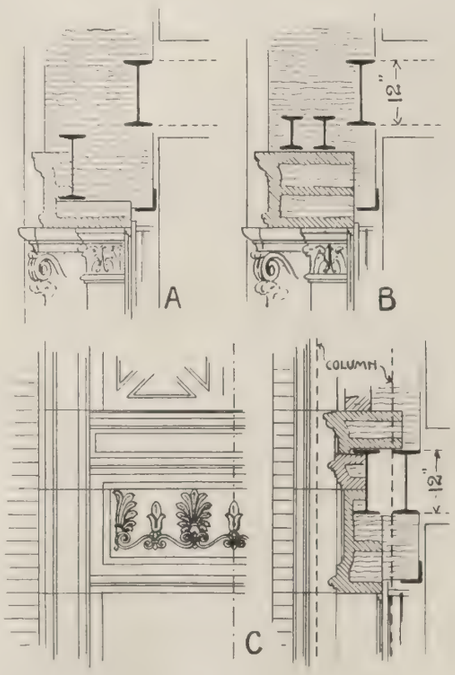


FIG. 51.

both. The inverted tee resting upon them was not only quite unnecessary, but positively suicidal, so far as the terra-cotta was concerned. There is no reason why the blocks in that platform should have been severed longitudinally at this point, in order that a superfluous piece of iron might be inserted in the joint; thus creating another source of weakness no less mischievous than the one just referred to. Yet it is in this way, we regret to say, that a number of such balconies were actually constructed on a certain building of which they are supposed to be an enduring feature.

The people who made the work are conscious of these defects, but excuse themselves at the expense of the architect, alleging that it proposed construction was fairly practicable, and that it could be attempted without endangering their own reputation. If not, their next step would have been to point out its defects and offer a feasible alternative, which, in all probability, would have been accepted with thanks by the architect.

A plan such as this is shown in sections A.A., B.B., and C.C., which, being simple and direct, would have been really much less expensive in point of execution. The modillion in this case would be made with four walls and one horizontal partition, forming two open chambers, as at C.C. Into the upper one of these we would insert a 3½ by 5 in. I beam, the end of which would be attached to floor beam,

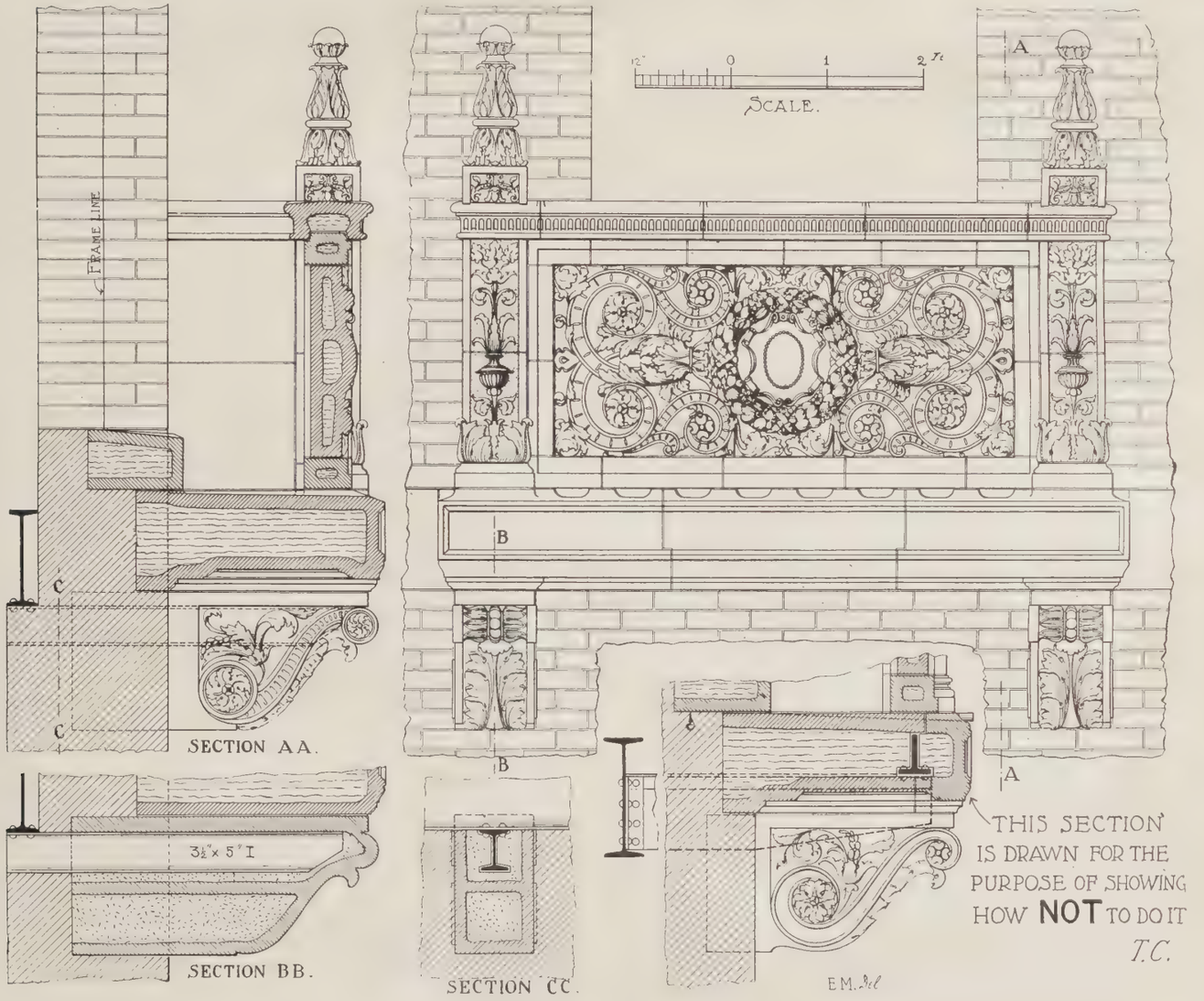


FIG. 52.

is "made according to detail." He, in turn, contends that they were long enough in the business to have known right from wrong, detail or no detail, and that, as specialists in their line, they were expected to make good just such deficiencies. On the whole, we think he has the more valid half of the argument. Meanwhile it may not, perhaps, be without reason that those best acquainted with the facts are said to prefer the opposite sidewalk.

The quality of the terra-cotta, as such, is excellent, being artistically modeled, sufficiently fired, and of good texture, but those who made it did not fully realize the extent of their responsibility. Had they done so, their first duty would have been to see that the and the surrounding space then well filled with concrete, as at B.B. In this way we would get the full strength of the cantilever cased in cement, without weakening the modillion by needlessly cutting through its outer shell. There need not then be any doubt as to the reliability of two such brackets of composite construction. The platform would be made in three complete blocks of moderate size, two of them resting directly on the brackets, the center block joggle jointed on two sides, with a third side built into wall. As the simplicity and security of this arrangement will not be denied, it may be allowed to rest on these merits without further comment on that behalf.

Strength of Brick Masonry.

BY IRA O. BAKER.

M. Am. Soc. C. E., Professor of Civil Engineering, University of Illinois, Champaign.

AN excessive estimate of the strength of a structural material results in a weak and possibly dangerous construction; but, on the other hand, a failure to appreciate the possible strength of the material used needlessly increases the cost of the structure. From the very nature of the case, the architect or the engineer is more ready to accept the second condition than the first. If he overestimates the strength of the material he uses, he endangers his own reputation and possibly the lives of others; but if he underestimates, the client pays the bill without being any the wiser. In case of doubt, it is proper to lean toward the side of safety, but the architect or engineer owes it to his client to make a safe but not excessively strong structure. This requires that the designer should know the strength of his structural materials and the method of using them most economically.

Apparently there is more extravagance in the use of masonry than of any other structural material. As an illustration of this may be cited the past and present practise in building masonry arches. The Pont-y-Prydd Bridge, in Wales, is a segmental masonry arch having a span of 140 ft., and a rise of 35 ft. (one fourth of the span), and is built of small, rough rubble masonry in lime mortar. The arch ring is only 1 ft. 6 ins. thick at the crown and the same at the springing. It was built in 1750, and after four generations is still standing. Over against this example may be cited the Westminster Bridge, in London, which has a span of 76 ft., a rise of 38 ft., and a thickness at the crown of 7 ft. 6 ins., and at the haunches of 14 ft. The span of the Westminster is about half that of the Pont-y-Prydd, and the thickness varies from five to nine and one third times that of the Pont-y-Prydd. The first is built of small stones as they come from the quarry, and the second of carefully cut large blocks. Of course the first carries only a country highway, while the latter carries a main street of a great metropolis; but even a little comparison shows that the last is extravagantly designed. Several other almost equally striking comparisons could be made between very early and more modern examples of arch construction. Again, innumerable comparisons could be made between American railroad arches which stand without any signs of failure, and others which are unquestionably many times stronger — in some cases ten or twenty times — and this notwithstanding the fact that all the evidence shows that the former are extravagant. It is nothing uncommon to find arches of considerable size that certainly have a "factor of safety" of, at least, one hundred. The cases of arches have been cited, since they are the only structures in which the ultimate strength of the masonry is even approximately approached. The load on masonry towers, mullions, piers, etc., is often still more extravagant. Of course, in many structures, particularly small ones, other elements than the strength of material determines the dimensions, and in small structures an excess of material is not important; but in larger structures the dimensions of the parts are usually determined by the strength of the material, and an excess is a serious matter.

Within certain limits it can reasonably be said that if no one of a considerable number of structures has ever failed, it is probable that some, perhaps many, of them are extravagantly designed. This principle obtains in the evolution of a machine or of a bridge. A certain part is made too small and breaks; a new and larger one is made, but after a time it also breaks; a third and still larger one is made, which does not break, at least for a long time. In this case it may safely be concluded that the part as last made is of proper design. On the other hand, if a part is made too heavy, competition or economy will prompt some one to make it smaller; and if it successfully does the work, it is proof that before it was uneconomically designed.

Did any one ever hear of a brick pier being crushed, even in a temporary structure, where it would be entirely proper to design on a smaller margin of safety than in a permanent structure? Of course, oftentimes the size of a pier is determined by its resistance to being overturned by accidental blows before its vertical load comes upon it, rather than by the load it is ultimately to support; but the fact remains that since it is very rare to find brick constructions that have failed, owing to excessive loads, it is probable that many such are extravagantly designed.

How comes it that masonry is used so extravagantly? There are two reasons: First, many designers more or less blindly follow preceding practise. Mr. A designs a structure without much knowledge of the strength of the masonry he uses. Next, Mr. B is called upon to design a structure a little higher or heavier than Mr. A's, and he adds to Mr. A's sizes without knowing whether A's structure was extravagant, and without knowing whether the increase in size is proportional to the increased load. Mr. C then treats B's structure as the latter did A's, each saying that as masonry is cheap, he will be sure to make it large enough. With a higher-priced material this process is less likely to take place, since the requirements of economy will probably determine the elements of the design.

A second reason for the unintelligent design of masonry structures is the lack of definite information as to the strength of masonry. Until very recently there have been no experiments to determine either the strength of brick masonry or the law of its variation, and even now there has been no experimental determination of the strength of stone masonry. Therefore, since existing structures give no definite information as to the actual strength of masonry, it is not surprising that the strength of brick and stone have not been utilized scientifically.

RESULTS OF EXPERIMENTS.

Within the past few years several valuable series of tests have been made upon the strength of brick masonry, with the large and accurate testing machine of the United States Arsenal at Watertown, Mass., under the direction of the War Department. The reports of the tests are published annually under the head of "Reports of Tests of Metals and Other Structural Materials made at Watertown Arsenal, Mass.," and are included in the annual report of the Secretary of War. They are also published separately. The experiments on brick masonry are described in the following volumes: —

Report of Tests of Metals, etc., 1883 (Senate Executive Document No. 5, Forty-eighth Congress, First Session), pp. 217–20; *ibid.*, 1884 (Senate Ex. Doc. No. 35, Forty-ninth Congress, First Session), pp. 69–124 and 235; *ibid.*, 1886 (House Ex. Doc. No. 31, Forty-ninth Congress, Second Session), Part II., pp. 1691–1742; *ibid.*, 1891 (House Ex. Doc. No. 161, Fifty-second Congress, First Session), pp. 739–43; *ibid.*, 1893 (House Ex. Doc., Fifty-third Congress, First Session, without a distinguishing number), pp. 323–34.

In all, 97 tests were made of piers built of various kinds of brick and mortar, varying from 2 to 10 ft. in height, and from 8 to 16 ins. square. These experiments are very valuable, but have not received the attention their importance warrants, possibly because the reports of them are scattered through several volumes which are more or less inaccessible. The above volumes contain practically only the numerical results of the experiments, and it is proposed here to discuss these experiments somewhat fully.

Kind of Brick. — Three grades of brick were used. The weakest were second-hand "medium hard-burned common brick," designated in the official report as Bay State brick. The strongest were "hard-burned common brick," designated as common brick. The best were a hard-burned, medium smooth and regular pressed brick, designated as face brick. The brick were tested by grinding the broadest surface approximately flat with loose emery on a face plate and crushing between steel pressing surfaces. The average crushing strength of the first was 11,406, of the second, 18,337, and of the third, 13,925 lbs. per square inch.

In determining the crushing strength of brick and stone it is customary to test cubes, since with specimens broader than high the

pressing surfaces materially increase the apparent strength of the material. Judging from experiments made by the writer on the relative strength of cubes and whole brick, it is probable that cubes of the above brick would have shown a strength of only about half the above results, which shows that the brick were not remarkably strong, since cubes of brick frequently test 15,000 to 20,000 lbs. per square inch, or even more.

Method of Building Piers. The piers were built by a common mason under instructions to do ordinary work. The bond was broken every course. After building, the piers were stored under a dry shed.

Age when Tested. The piers were from fourteen to twenty-four months old when tested, unless herein otherwise stated.

Strength of Lime Masonry. Nine piers from 2 to 10 ft. high and 12 ins. square, built of the weakest brick (medium-burned common brick) laid in common lime mortar, showed an average strength of 1,118 lbs. per square inch. Neglecting for the present the effect of the height of the pier, let us see if we can arrive at an adequate conception of the meaning of 1,118 lbs. per square inch. Ordinary brick masonry weighs from 120 to 130 lbs. per cubic foot, or a prism of such masonry 1 in. square and 1 ft. high would weigh not more than 0.9 lbs. Therefore, 1,118 lbs. per square inch is the pressure at the base of a wall of ordinary brick masonry 1,240 ft. (nearly a quarter of a mile) high. This is a fair average for the weakest grade of masonry experimented upon. The highest in this series was 1,270 lbs. per square inch, and the lowest 779 lbs. per square inch. Not infrequently men refuse to buy soft brick, "because they are not strong enough to bear the pressure" of a two or three story house.

Method of Failure. "The first sign of failure was the formation of cracks in the brick opposite the end joints in the adjacent courses. As the load increased these cracks gradually widened and increased in length, final failure occurring by the partial crushing of some of the brick and the enlargement of the longitudinal cracks. This manner of failure was common to all piers." In other words, the piers failed by the brick breaking across, after which the parts separated. The brick break transversely because of the irregularities of form, and because of the unequal distribution of the mortar in the joints — probably chiefly the first.

Effect of Irregularity of Form of Brick. The experiments give significant evidence as to the effect of irregularity upon the strength of masonry. Hard-burned common brick having a strength of 18,337 lbs. per square inch gave, with lime mortar, 1,814 lbs. per square inch; while face brick having a strength of only 13,925 lbs. per square inch gave a strength of 1,814 lbs. per square inch. The quality of brick is indicated somewhat by the fact that the face brick were laid with ⅛ in. joints, and the common brick with ¼ in. The first brick were practically 10 per cent. the stronger, while the masonry was nearly 10 per cent. the weaker. With Rosendale natural cement mortar the face brick gave 15 per cent. greater strength, and with Portland cement mortar the face brick gave masonry 34 per cent. stronger than the stronger common brick. In other words, the weaker but more regular brick gave the stronger masonry. Not infrequently architects and owners, particularly the latter, reject the softer and more regular brick for the harder and more irregular, on the supposition that the latter will make the stronger wall. Within reasonable limits the reverse is more nearly true, as shown above.

(*This paper will be concluded in the April number.*)

THE subject of the John Stewardson Memorial Scholarship, the competition work for which is just commenced, is unique. A farm standing on typical Pennsylvania farm land, with barns, farmyards, gardens, etc., is the problem, and one that the ten young men now at work on it must find full of interest.

THE Pittsburgh Chapter of the American Institute of Architects are arranging for their first public exhibition. It is to be held in the Carnegie Art Galleries early in May. Many prominent architects throughout the country have already expressed their intention of exhibiting drawings.

On the Saline Efflorescence of Bricks.

THE CAUSES LEADING TO IT, AND THE PRACTICAL MEANS OF AVOIDING THE SAME.

BY OSCAR GERLACH (PH. D., BERLIN).

I PROPOSE in the following article, the first of a brief series, to consider the mode of origin of the common saline efflorescence of bricks. A series of researches which I conducted at the *Laboratory for Clay Industries* of Professor Seeger and E. Cramer, of Berlin, Germany, and which were continued in practical work in America, furnished me with results that not only afford a clear explanation of the origin of efflorescence, but also point to the practical means of avoiding the same. The means of avoidance I shall discuss in a separate article.

By "efflorescence" I understand what is commonly termed "whitewash," wherever and whenever such incrustations appear. For the sake of clearness I shall follow the process of brickmaking in all its successive single stages, as commonly conducted, and point out at each step the causes concerned in the production of the chemical salts occasioning the annoying superficial colorations in question.

Most noticeable and most annoying are the *white* efflorescences on red or yellow brick; less striking are the green and yellow incrustations on light brick. The white efflorescences are always of inorganic or mineral origin, being mainly sulphates of lime, magnesia, and alkalies. We shall consider here the formation of the white efflorescences, reserving the green and yellow for another occasion, and as a matter of clearness distinguish carefully between: —

1. The formation of efflorescent sulphates which are found *already formed* in the clay pits, or which are first formed from *allowing the clay to lie unused* for a certain length of time, or which arise at any time *during the making of the clay* into green bricks; and

2. The formation of sulphates which arise during the water-smoking and during the burning of the green material in the kilns.

This distinction is necessary, because practical brickmakers are prone to think that water-smoking alone is the cause of the whitewashing sulphates making their appearance on the finished products.

I.

ON THE FORMATION OF THE EFFLORESCENT SULPHATES IN THE CLAY BEDS, ETC.

The majority of clays used in brick and terra-cotta making contain greater or less quantities of mineral salts. Chemical analysis has shown that these salts are sulphates of lime and magnesia, less frequently of iron and alkalies. These sulphates are formed by the weathering of finely and uniformly distributed particles of iron pyrites, which is an almost constant accompaniment of the clay. Through the action of water, air, and heat the iron pyrites (FeS_2) is gradually oxidized and converted into ferrous sulphate ($FeSO_4$), which, being easily soluble in water, is, in union with the carbonates of lime, magnesia, and alkalies, whose constant presence can also be shown, converted into the respective sulphates of these combinations. For example, $FeO.\ SO_3 + CaO.\ CO_2 = FeO.\ CO_2 + CaO.\ SO_3$.

It is readily intelligible now that the more minute the distribution of the iron pyrites is in the clay, and the more the mass as a whole is exposed to the influences of the weather, *i. e.*, to the effects of water, air, and heat, the greater the quantities of iron pyrites oxidized and the greater the quantities of soluble sulphates stored up in the clays. If we are using, for instance, a stony clay belonging to the carboniferous formations, which always contain heavy quantities of iron pyrites (*e. g.*, blue shale), and work the same into green bricks immediately, and at the beds where the clay is found, then certainly the whitewashing is far less apt to be noticeable than if the

clay had been suffered to lie for months before using, exposed and in the open air.

To prove this, I analyzed several specimens of clay from the same pit, and so determined the amount of soluble sulphates in each. One specimen was taken from the upper layer of the clay, another from a lower layer quite protected from the air and heat. The analysis showed that the upper layer contained four times as much soluble sulphates as the lower, protected layer.

Another experiment yielded similar results. I took *three* specimens from the *same* layer of clay. Of the first specimen, 100 grams were *immediately* analyzed and the amount of sulphates therein contained determined; of the second specimen, 100 grams were finely pulverized, moistened, and exposed to the weather for three months, and at the expiration of that time analyzed for the amount of sulphates; while 100 grams of the third specimen were likewise finely pulverized and let lie for three months in a dry, hermetically sealed tin box and then analyzed. It turned out that specimens 1 and 3 contained almost equal amounts of sulphates, while specimen 2 showed six times the amount of the others. Another clay, likewise belonging to the carboniferous period, having been let lie for months in the open air, left behind it on the ground where it had been heaped large quantities of beautifully formed gypsum crystals.

But even if such clays are worked into bricks immediately upon being transported from the pits, it does not necessarily follow that the formation of sulphates will be entirely prevented. If the green bricks be let stand a long while in the drying rooms a constant oxidation of the iron pyrites will take place on the surface of the bricks through the action of the moist atmosphere, and, concomitantly with this, the formation of sulphates which, while not visible to the eye in the green bricks, will, after burning, make their appearance in the shape of whitewash. To prevent this, not only is the immediate working of the clay into green bricks necessary, but it is also requisite to dry and to burn the bricks with all the expedition possible.

The oxidation of iron pyrites is accordingly a main cause of the formation of sulphates occasioning whitewash. A second source is the sulphur contained in the water employed in the preparation of the clay. This water frequently contains gypsum; and since many clays require so much as 30 per cent. of water for rendering them plastic, the gypsum present in the water naturally contributes a high quota to the formation of the annoying superficial efflorescences in question. So, too, by various other admixtures, as mineral colorings, oxide of iron, ochre, superoxide of manganese, the whitish efflorescences can be augmented. Wherefore, it is necessary that all such substances when used as admixtures should, without exception, be analyzed for the amount of sulphates they contain.

The quantity of water requisite for working the clay depends wholly on the nature of the clay and on the peculiar methods employed in working it. The greater the quantity of water, the greater the quantity of the sulphates dissolved in it, and the greater the quantity of dissolved salts deposited on the surface of the bricks in drying.

The method of drying is also of paramount importance, both as bearing on the formation of these efflorescences and as affecting their visibility on the surface. The quicker the drying can be perfected, the more advantageous will be the appearance of the burnt product, for in a perfectly dry brick all further oxidation of the iron pyrites is absolutely excluded; and then again, in consequence of the rapid evaporation of the water, the dissolved sulphates are not wholly deposited on the surface of the product, but in large part are left behind in the pores of the clay. The drying process consequently deserves the highest attention at the hands of the practical brickmaker. But since the space at my present disposal is limited, I shall reserve the discussion of the advantages and disadvantages of the different methods of drying for a future occasion.

To recapitulate: the substances giving rise to the efflorescence or whitewash of green clay products are (1) the soluble sulphates contained in the natural clays, and (2) the sulphates formed during the storing and initial treatment of the clays consequent upon the weathering of the iron pyrites and its resultant transformation into sulphuric bases. It remains to be mentioned that the efflorescences which find noticeable lodgment upon the green, unbaked material are subsequently burnt in indelibly on the surface of the brick, and can be removed neither by chemical nor mechanical means.

II.

ON THE FORMATION OF SULPHATES WHICH ARISE DURING THE WATER-SMOKING AND DURING THE BURNING OF THE GREEN MATERIAL IN THE KILNS.

The presence of iron pyrites in the clay is, we have seen, the main cause of the origin of whitewashing sulphates on the surface of the unburnt material, and iron pyrites again is chiefly concerned in the production of whitewashing sulphates during the water-smoking and burning of the green products. This happens in a twofold manner — first, and again, by the presence of iron pyrites in the clay; and secondly, and particularly, by the iron pyrites contained in the coal, which is mostly used as a fuel.

In burning two processes are distinguished: (1) water-smoking, and (2) burning proper.

WATER-SMOKING.

The object of the water-smoking is to expel the water which has been mechanically absorbed by the clay, and which still remains in it after drying,— the so-called "hygroscopic" water,— whereby the clay is thoroughly dried, but loses none of its original physical qualities. The purpose of burning, on the other hand, is (1) the expulsion of the water *chemically* contained in the clay (clay substance being essentially $Al_2O_3(SiO_2) + 2H_2O$, (2) the chemical disintegration of the several components of the clay, and (3) a more or less perfect fusion of the individual argillaceous particles, whereby a definitive and permanent alteration of the substance is attained. With the loss of the chemically contained water, the clay loses its plasticity — a property so essential to the manufacture of argillaceous products.

We shall consider the process of water-smoking first, which has for its object the expulsion of the hygroscopic water. Since water is converted into steam at 212 degs. Fahr., this latter is the proper temperature for the process — attainable only by the artificial convection of heat to the products, *i. e.*, by the consumption of fuel. But since the size and the construction of the kiln in which the water-smoking is conducted renders it absolutely impossible for a perfectly uniform temperature to be obtained throughout the whole enclosed space, consequently that portion of the kiln and of the contents of the kiln which first comes in contact with the hot gases from the fireplace will be heated first. At these points a part of the water in the green products will be converted into steam, whilst at points more remote from the fireplace scarcely any rise at all in temperature will be noticeable. At these latter points the water vapor originating at the first points will be condensed and precipitated on the surface of the cold green products, whence, since the clay is strongly hygroscopic, it will be absorbed into the interior of the bricks. If the clay, now, still contains soluble sulphates in its interior, these sulphates will be dissolved in the water, and later, when the points in question have in their turn reached evaporating heat, will be drawn to the surface of the bricks, and, as the heat is increased, be burnt in there. If the green clay does not contain sulphates, or if the sulphates be rendered innocuous by the admixture of appropriate chemicals, the water so condensed will have no injurious effect upon the appearance of the bricks, provided the fuel employed contains no sulphur. But if a sulphurous fuel be employed,— for example, coal, which always contains more or less iron pyrites,—the water will absorb the gases of the sulphurous acids produced by the combustion of the iron pyrites, and this diluted acidic solution will act on the carbonates in the clay and form sulphurous salts, which, as the heat increases, will come to the surface and there be oxidized to sulphuric salts, thus causing again the annoying colorations.

(*Continued.*)

Fire-proofing.

HOW TO BUILD FIRE-PROOF.

BY FRANCIS C. MOORE,

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Delegate of New York Board of Fire Underwriters to the Board of Examiners of the New York Building Department.

BY way of preface to the following article, I wish to say that it has been prepared after careful consultation with well-known experts, and after careful observation and study of numerous fires in this class of structures, and especially in those which caused losses to my own company.

I think it advisable, in an article of this kind, to state, as premises, certain propositions which might be treated as deductions. Some of them are axiomatic or self-evident, needing no demonstration, and ought to appeal to any practical mind as being truths, rather illustrated than demonstrated by the experience of the past few years. In accordance with this line of treatment, I desire to state by way of premise: —

First. It may be claimed that no construction is fire-proof, and that even iron and masonry could with propriety be designated as "slow burning." The iron or steel used in a modern building has, in its time, been smelted in a furnace which presented no greater capacity for running metal into pigs than some of our modern buildings, whose interior openings from cellar to roof correspond to the chimney of a furnace, and the front door to its tuyere. If a pyrometer could be adjusted during the progress of a fire it would be found to rise quite as high as in any forge.

Second. Glass windows will not prevent the entrance of flame or heat from a fire in an exposing building. It may seem strange that so obvious a proposition should be thought worth stating, and yet to-day more than 75 per cent. of the "fire-proof" structures of the country have window openings to the extent of from 30 per cent. to 70 per cent. of the superficial area of each enclosing wall without fire-proof shutters. Heat from a building across a wide street finds ready entrance through windows, and the several fire-proof floors serve only to hold ignitable merchandise in the most favorable form of distribution for ignition and combustion like a great gridiron to the full force of a neighboring fire. This was the case in the burning of the Manhattan Bank Building, on Broadway, in New York, and of the Horne Building, in Pittsburgh. The latter building was full of plate glass windows, 16 by 16 ft. Such buildings are not more capable of protecting their contents than a glass show-case would be. A recent article on the Pittsburgh fire in the *Engineering News* aptly expresses this in the following words: "There seems to be some irony in calling buildings fire-proof which opposed hardly anything to a fire from across the street more sturdy than plate glass!"

Third. Openings through floors for stairways or elevators, gas, water, steam pipes, and electric wires, from floor to floor of fire-proof buildings tend to the spread of flame like so many flues and should be fire-stopped at each story. This fault is more generally overlooked than any other. Ducts for piping, wiring, etc., should never be of wood, In the Mills Building, in New York, a fire, not long since, jumped through two or three floors from the one on which it originated, by means of the passageways for piping, electric wiring, etc., comparatively small ducts, but sufficient for the spread of flame. In one instance the fire skipped one floor, where it was cut off, and ignited the second floor above.

FIRE-PROOFING IRON MEMBERS.

Fourth. In view of the fact that it is necessary to cover iron with non-combustible, non-conducting material to prevent its exposure to fire and consequent expansion, and in view of the fact that all ironwork, except cast iron, will rust to the point of danger, it is best to use cast iron for all vertical supports, columns, pillars, etc. It is not advisable, of course, to have floor beams of cast iron (except in the form of Hodgkinson beams thoroughly tested). If a floor beam should give way, however, it might not necessarily wreck the building, whereas if a vital column should give way a collapse of the entire structure might result.

RUST.

At a convention held some years ago in New York, at which were present a greater number of experts in iron than probably ever met before or since in one room, there was not one who contended that cast iron would rust beyond the harmless incrustation of the thickness of a knife blade, whereas there was not one who did not believe wrought iron would rust to the point of danger; and there was not one who claimed to know whether steel would or not, each admitting that steel had not been sufficiently tested as to rust to warrant a reliable opinion. If it could be relied upon as rust proof, it would be superior to all other material for fire-proof buildings because of its great strength in proportion to weight. The use of steel in construction is growing, because it is cheaper than wrought iron, as lighter weights are used for the same strength, but while supposed to be superior to wrought iron, some of the prevailing impressions with regard to it are erroneous. Defects not possible of detection by tests are liable to exist in its structure. Among the first steel beams brought to the city of New York there were instances in which they were actually broken in two by falling from the level of trucks to the pavement, probably due to their having been rolled when too cold, as steel when rolled below a certain temperature becomes brittle. Better beams are now made.

In my opinion, cast-iron columns are superior to steel and more reliable. It is not generally known that American cast iron is vastly superior to English cast iron, and will stand a greater strain without breaking. Cast iron, moreover, will not expand under heat to the same extent as wrought iron and steel, which is another fact in its favor.

COLUMNS SHOULD BE STRIPPED.

No bearing column should be placed in such a position that it cannot be uncovered and exposed for examination without danger to the structure. One of the ablest architects in New York makes it a rule to so fire-proof his columns that they can be examined at any time by removing the fire-proofing to determine whether rust has invaded their capacity to carry their loads. In my judgment, periodical examinations should be made, from time to time, in this way of all wrought-iron or steel columns, as it may happen that a leaky steam or water pipe has worked serious harm. Such a discovery was accidentally made recently in an important New York building.

CEMENT AS A PREVENTIVE OF RUST.

Numerous newspaper paragraphs appear, from time to time, which claim that metal stripped of its covering of cement has been found exempt from rust, with the paint intact, etc., and the fact is cited as evidence that cement is a preservative of iron and that the danger of rust is over-estimated. It is probable that cement will protect paint for a long time, and, of course, paint, if properly put on, will protect iron while the oil in it lasts. Painting, by the way, should be done with the best quality of linseed oil and without the use of turpentine, benzine, or dryers. It should be thoroughly applied in three coats, with about a gallon to 400 sq. ft., and the iron should be first thoroughly cleaned of rust and dirt, by pickling or other process. Paint is rarely properly applied, however, and even when of the best quality, is a preservative of the metal, as already stated, only so long as the oil in it lasts.

Those who claim to have evidence of the exemption of iron from rust rely, I think it will be found, upon iron which has been under exceptionally favorable conditions, free from dampness, the action of gases, etc., overlooking the fact that a leaking water pipe or steam pipe, or the escape of gases from boiler furnaces, will attack iron and gradually but surely consume it. A notable instance of this is the case of the plate girder of the Washington Bridge over the Boston & Albany Railroad, in Boston, where a quarter-inch plate girder was recently found to be entirely consumed in places from the operation of gases from the locomotives passing below.

It is quite common to have advocates of wrought iron cite railroad bridges and the elevated railroad structures of New York as proof of their claims, but if they will take the trouble to examine these structures they will discover that in spite of the fact that they are exposed to view, so that they can be painted frequently, the evidences of rust are unmistakable, especially about the rivets; and one can well imagine what would be the result in the case of riveted iron members in the skeleton structure of a building where such ironwork is entirely concealed from view, periodical inspections being impossible.

Rust is especially liable in the cellars and basements of buildings. The wrought-iron friction brakes of freight elevators in the cellars of stores, for example, are frequently found so consumed with rust as to be easily rubbed to pieces in the hand.

Steel rivets are dangerous and they should never be used, unless of a very superior quality, so soft that hammering will not crystallize the material, and yet with sufficient tensile strength to insure perfect holding qualities. This is difficult to secure. Their use in columns for buildings is objectionable, as they rust badly under certain conditions; columns, therefore, should be without rivets, and the beam-bearing bracket shelf on cast-iron columns should be cast in one piece with the column.

EXPANSION OF IRON.

It is generally supposed and frequently stated that there is a great difference between the expansion of iron and masonry by heat. This is not the case. For example, the length of a bar which at 32 degs. is represented by 1, at 212 degs. would be represented as follows: —

Cast Iron	1.0011
Wrought Iron	1.0012
Cement	1.0014
Granite	1.0007
Marble	1.0011
Sandstone	1.0017
Brick	1.0005½
Fire-brick	1.0005

In the fire-proof building of the Western Union Telegraph Company, in New York, some years ago, a heavy brick pier, 7 or 8 ft. in diameter, adjoined the wall of the boiler furnaces. The difference in expansion in the brickwork next to this furnace wall as compared with that of the remaining brickwork of the pier was so great as to produce a crushing of the material from top to bottom of the pier for a depth of several inches, and it was found necessary to change the furnace wall and leave an air space between it and the pier.

EXPANSION.

While the difference in expansion between masonry and iron incorporated with it is less per running foot than is generally supposed, and while the difference in expansion between a cubic foot of iron and that of a cubic foot of masonry would hardly be noticeable, especially if the iron were covered on all four sides, yet in stretches of 50 ft. or more, as in the case of iron I-beams and girders, the cumulative effect of expansion in uncovered iron might be a serious matter — quite sufficient with the rises of temperature due to a burning building to push out the bearing walls and wreck the building. Especially is this true of temperatures higher than 500 degs. It is unnecessary to suggest that metal differs from masonry in the important respect that heat does not travel throughout the entire length of the latter, while it does in the case of metal.

In other words, while the difference between the expansion of a lineal foot of iron as compared with a lineal foot of masonry, marble, brick, etc., is very slight, the difference in conductivity is very great. The conducting power of silver, for example, being represented by 1, copper would be .845, cast iron .359, gold .981, marble .024, and brick .01 — an important fact to be considered in the construction of buildings. Brickwork raised to a white heat would not raise the temperature of other masonry in the same wall a few feet away, but one end of an iron I-beam could not be raised to a white heat without raising the temperature of the beam for its entire length.

It is a well-known fact that iron responds so readily to temperature that, in surveying land, a surveyor's 100 ft. iron chain will, in measuring the distance of a mile, result in a variation of 5 ft. between winter temperature and summer temperature, resulting in an error of one acre in every 533.

Where iron beams and girders are inserted in walls without sufficient space left for their expansion under heat they are almost certain to overthrow the bearing walls by their expansion thrust. A large warehouse in Vienna in which such provision had been contemplated by the architect was totally destroyed, with its contents, by reason of the fact that an officious subordinate, discovering the space in the wall purposely left at the end of each beam, deliberately poured liquid cement therein, which, having set, effectually thwarted the well-meant intention of the architect, and resulted in the destruction of the building.

The expansion thrust of iron beams may be computed upon the following factor of expansion: Rolled iron of a length of 1,562 ft. will expand one eighth of an inch for every degree of temperature. The heat of a burning building as already stated is enormous — sufficient to fuse most known materials; it may safely be estimated to be at least 1,000 degs.; therefore a length of rolled iron of 1,562 ft. at 1,000 degs. of temperature would expand about 125 ins., and a 50 ft. length of iron girder would expand between 4 and 5 ins., showing that there should be a play at each end of at least 2 ins. if the iron is not fire-proofed. Inasmuch as in iron construction the iron beams and girders are usually anchored to the walls to steady them, the space should be left and the tie to the anchor should be by a movable hinge joint, which would be of the same strength with an inflexible anchor for all tying purposes, but would yield under the thrust pressure like an elbow and allow play of the beam, or stiff anchors should have elongated holes to allow expansion when beams are of great length. Girders are seldom over 25 ft. long, but if bolted together, as is frequently the case, they may be 120 ft. or more long, and a line of columns from cellar to roof of a building may easily have one continuous iron structure of two hundred or more feet. It should be remembered, however, that this danger from the expansion of iron may be almost wholly counteracted by protecting it from exposure to fire through the use of non-conducting material. It is more important to protect girders than beams.

The mistaken pride with which the owners of some buildings point to exposed iron beams in ceilings as evidence that the floors are "fire-proof," actually justifying the supposition that they are left exposed for such display, would be ludicrous if it were not serious. In buildings occupied for offices or dwellings, where there is not sufficient combustible material to endanger the beams, it is not so objectionable; but in warehouses and stores, filled with merchandise, such construction is dangerous; and if one of the upper floors should give way it would come hammering down to carry all below and thoroughly wreck the structure.

In this connection it is well to say that combustible merchandise should never be stored 100 ft. above the street grade even in a fire-proof building, since the average fire department cannot reach it at that height.

ROOF.

Fifth. The roof, that portion of a building which ought to be most carefully watched during construction, is often the most neglected, woodwork entering into the composition, as in the case of the Horne Building, at Pittsburgh, where the cornice was supported on wooden outriggers.

Sixth. Partitions. These should not be erected upon wooden sills, as is sometimes the case — only, however, with ignorant and inexperienced architects, who suppose that it is necessary to use wood in order to nail baseboards and other trim at the bottom of the partition. Porous terra-cotta will hold nails and should be used in preference to wood, which, as soon as it burns out, will let down the entire partition.

WATER STANDPIPES.

Seventh. All buildings over 125 ft. high should be provided with 4 in., or, better still, 6 in. vertical pipes, with Siamese connections at the street, for the use of the fire department, extending to the roof, with hydrants at each story and on the roof. This would save the time of carrying hose to upper floors — a difficult task in the case of high buildings. Ample tanks of water should be provided on the roof supported by protected iron beams resting on iron templates on the brick walls, to supply the building's inside pipe system for fire extinction, and secure pressure by gravity or by some other method constantly operative, especially on holidays and at night. Stone templates should not be used, and care should be taken to secure strong supports so that, in the event of fire below, the tanks will not come crashing through the building to destroy it and endanger the lives of firemen. Two such disasters in fire-proof buildings within a year show how true is this proposition. Tanks in the basement under air pressure are also a great advantage, and recent invention has perfected them to the point of reliability.

Fire Marshal Swenie, of Chicago, urges that standpipes should not be less than 6 ins. internal diameter, and that a check valve should be provided, so that when steamers are attached their force will be added to that of the local pumps. Each floor should have hose connections with the standpipes and sufficient hose to reach to the most remote point of the floor above, and this hose should be frequently inspected to see that it is in order. He recommends that a code of signals by which communication can be established between the firemen and the engineer of the building is essential.

NIGHT WATCHMAN.

Eighth. All high buildings should have constantly present, night and day, some competent person understanding the elevator machinery, fire appliances, etc., so as to aid the firemen in reaching the upper levels; and there should be sufficient steam in the boilers, at all times, to run one elevator.

I quote from the valuable treatise on handling fires in these buildings presented by Fire Marshal Swenie to the International Association of Fire Engineers held in August, 1897. He says: —

"In case the elevators fail it is necessary to use the stairway, and after the truck men should follow the pipe men bearing the necessary hose, and this must be carried on the shoulders of the men. A 50 ft. section of ordinary 2½ in. cotton hose with couplings weighs from 56 to 60 lbs., and 250 ft. of 1¼ in. rope about 65 lbs., either of which is a good load for a man who must climb a steep stairway to the height of 250 ft. With an average rise of 7 ins. per step, that means taking some 430 vertical steps before reaching the scene of action and consuming from 7 to 10 minutes of time. If it is found necessary to use hose instead of the standpipes for taking the water from the street to the floor, the hose should be taken up in the elevator, if it is running, and then lowered until connection is made with the hose below."

STONE STAIRCASE TREADS.

Ninth. Marble, slate, and other stones are certain to disintegrate or crumble when subjected to the joint action of heat and water. For this reason 90 per cent. of the staircases in modern fire-proof buildings would be found utterly unreliable in the event of fire, either for the escape of the inmates or for the use of firemen — a serious consideration. Stone treads are usually let into iron rabbet frames, and as these stone treads would give way in case of fire, it would be impossible for a person to find a footing on the stairways; 2 in. oak treads might actually last longer; but a safer staircase would be one the framework of which is of iron, the tread having an iron web or gridiron pattern, the interstices or openings of which should be small enough to prevent the passage of a foot, underlying the stone or slate, so that if the stone tread should disintegrate the staircase would still remain passable.

It is possible to have the supporting tread of open-work cast iron in an ornamental pattern, which in relief against the white marble tread resting on it would present a tasteful appearance from the underside or soffit of the staircase, with this great advantage that, in the event the action of fire and water should pulverize the marble or slate tread, it would still afford a safe support for the foot. In the case of the burning of the two fire-proof buildings, Temple Court and the Manhattan Savings Bank, in New York, the slate treads yielded early in the fire, leaving staircases with openings the full size of the tread, which, within a few minutes after the fire started, were impassable for either firemen or inmates. It is astounding that this vital fault should be so generally overlooked in fire-proof buildings.

I may here state that the Manhattan Savings Bank Building did not deserve to be called "fire-proof" for the reason that it had hollow spaces under the wooden floor boards, and that the iron beams and girders were not protected. Some of them were large riveted box girders, which yielded quickly to the heat of burning goods and pushed out the side walls.

It is generally supposed that it is not necessary to be careful as to stone treads in buildings occupied solely for offices separated in fire-proof hallways in which, it is claimed, there is nothing to burn; but in the case of one large fire-proof building of this kind in New York I found the space under the staircase in the basement story was used to store the waste paper and rubbish of the building — material particularly likely to cause a fire by concealed matches, oily waste, cigar or cigarette stumps, etc., and to make a lively and quick fire quite sufficient to destroy stone staircase treads. Even where there is no combustible material in the hallway, if the staircase is near windows stone treads may be destroyed by exposure to burning buildings and by the combustion of window frames, dadoes, and other wooden trim.

Tenth. No building should exceed in height the width of the street on which it is located, from the view point of light and health; nor in any case, in excess of 95 ft. for mercantile occupancy, nor a height in excess of 200 ft. for office occupancy.

DESTRUCTIBILITY OF CONTENTS.

Eleventh. It should be remembered that merchandise, furniture, etc., are combustible, no matter whether located in fire-proof buildings or in ordinary buildings. This obvious fact seems generally to be ignored. In fact, combustible material will sometimes be more effectually and thoroughly destroyed in a fire-proof building than in an ordinary building, since the early collapse of the latter may smother the fire and effect salvage, whereas fire-proof floors support the contents of the former and distribute them so that they are more certain to be destroyed. There was not a dollar of salvage in the great stock of merchandise in the Horne Building, at Pittsburgh. The entire household furniture of a tenant in one of the best fire-proof apartment houses in New York was totally cremated, and a fire in the Great Northern "fire-proof" Hotel, at Chicago, seriously burned the automatic organ to the extent of over $4,000. There is no more reason why the combustible contents of a fire-proof building should not be consumed than why the fuel in a stove should not be burned.

Twelfth. Enclosing walls. These should be of brick, the brickwork of the lower stories especially, if not of all, being laid in cement mortar. In fact, the specifications for a building in the compact part of the mercantile section of a city ought to be drawn in contemplation of the possible cremation of its contents and the generation of heat considerably greater than 2,000 degs. Fahr. The heat of a wood fire is from 800 to 1,140 degs.; charcoal, about 2,200 degs.; coal, about 2,400 degs. Cast iron will melt at between 1,900 and 2,800 degs.; wrought iron, 3,000 to 3,500 degs.; steel, 2,400 to 2,600 degs.; and if an architect should be required to draw specifications for a building adjoining others, with the knowledge beforehand that its entire contents, from cellar to roof, were to be totally consumed, and he were under a bond to pay damages to surrounding property, he would not be more severe in his exactions than should a building law protecting neighborhood rights in the enjoyment of property; for a mercantile or manufacturing building sometimes generates a greater heat in combustion than a smelting furnace.

The Masons' Department.

AN EXPERIMENT IN MUNICIPAL WORK.

PROMINENT among the many details of municipal government which must be worked out to a satisfactory conclusion by practical experience is that of the method of awarding contracts for public work. At the present time the law usually provides that all such work amounting to over a certain sum, usually from one to five thousand dollars, must be open to public competition. It has been supposed, until recently, that the most serious objection to this method of procedure was the fact that it resulted in a majority of cases in the awarding of the work to some second or third rate contractor who produced only ordinary or inferior work. But the mayor of one of our largest cities, after having tried to enforce his interpretation of the stipulation in a city building contract providing that "preference shall be given to union labor" (which his honor maintained, until the court rendered an adverse decision, was practically mandatory), has decided that the proper way to construct municipal buildings is to have the work done by union men and by the day. Of course, in order to try such an experiment, the existing laws requiring an open competition and the award to the lowest bidder must be repealed.

This change the master builders have opposed, probably as a matter of principle; but it is a question whether it would not be better in the end to permit the experiment to be made. The present methods are acknowledged to be bad, and certainly the only way to improve such conditions is to try other methods. But while it may on the whole appear desirable to know the result of having a public building built by the day by union labor, there are two serious difficulties which must be overcome before such a system can be successful.

The great objection to day labor on large and important works is, primarily, the fact that the men employed under such conditions have not the incentive to work to the best of their ability, and it is unquestionably a fact that the same gang of men on a contract job would do much more work in a given time than where the work was being paid for by day labor. The reason for this is so obvious that explanation is unnecessary. As things are at the present time, if a city building is built by day work, the length of time necessary for its construction and the bill for labor will probably present an interesting and at the same time an extravagant comparison with similar work done under the direction of an able contractor and his foremen.

The other reason why work done entirely by members of the various unions is likely to prove unsatisfactory is that up to the present time the unions have done but little to improve the quality of work, and this fact is responsible for one of their greatest weaknesses. Although this statement would probably be emphatically denied by union members or sympathizers, the fact remains that to-day most of the best mechanics either do not belong to the union at all, or else are indifferent and passive members.

The unions are now controlled and managed by a class of men who are better talkers than workers, but as soon as the skilled mechanics become enough interested in the union of their particular trade to control its policy and make its membership a guarantee, so far as possible, of the ability of its individuals, both as to ability to do work well and the capacity to do it quickly, then, and not until then, will the labor union feel the support of public opinion, which is absolutely necessary for its successful existence. But although these objections to the plan of having a municipal building built by day labor have been pointed out, and the opinion expressed that the result will be disappointing, nevertheless, let us by all means try the experiment, and very likely valuable lessons will be the consequence. Certainly in any, if not in a majority of cases, the best way to show the fallacy of socialistic schemes is to give them a full and fair trial.

THE ethics of trade are extremely nebulous in the minds of a great many persons. A feeling is often manifested that, considering the keen, sharp competition to-day, and the fact that the supply of work is so far below the desires and demands of the craftsman, the only motto to be considered is the one which has been popularly ascribed to one of our political bosses, "Do others as they would do you." Fortunately there is a saving remnant of those who do not ascribe to such doctrines, but make it their principle to be fair with those with whom they have dealings. The building trades, with their wide subdivision of interests and complexity of departments, offer a large opportunity for a contractor to take advantage of his fellows, especially in his relations with sub-contractors, and we wish to emphasize one evil which is only too prevalent, namely, the trading on sub-bids. A general contractor will make up a figure to be submitted in competition, and will use sub-bids for portions of the work, incorporating them in his own; and then if the contract is awarded him, in only too many cases does he deliberately ignore the sub-bidder over whose shoulders he has stepped to a contract, and, on the principle that he has a right to purchase his wares where he can get them cheapest, will proceed to make new deals with mechanics, and use his earlier bids as clubs to beat down the price. This is all wrong; it leads to demoralization of building interests, it encourages and almost obliges inferior work, and it is a practise which cannot be too severely condemned. The present system of contracting, where everything is awarded to one responsible head, has many advantages, but there ought in principle, as well as in fact, to be the most scrupulous regard for good faith between the general contractor and the sub-bidders, if we are to have the uniformity in the quality of the work which every one desires. Once a bid has been passed in and used it ought to be adhered to, and the sub-contractor whose bid is so used is entitled in equity to the contract.

Another feature which is often not properly regarded is the changing of a bid after it has been once made. There are plenty of owners who will endeavor to take advantage of a tight market, hard times, or scarcity of work, and will make a builder an offer of considerably less than his bid. We are sorry to say that some architects will lend themselves to this practise by endeavoring to please the owner, and will aid in beating down a contractor. We know of one architectural firm, however, doing a very large business, which has made it a rule, which is adhered to pretty thoroughly, never to allow a contractor to change a bid either up or down after it is once put in; and if after a bid has been made in good faith a builder cuts his price, that builder is very apt to find himself dropped out next time bids are called for. The result is that this firm gets bottom prices first time, as no bids are made with the idea of their subsequently being shaved off a bit. This is quite as it should be. We believe in fair and even liberal profits to all mechanics; but if a bid is respected as it should be, the bidding will be closer to start with, and there will be a feeling of honorable treatment between the owner and the contractor which will go far towards securing better work. The same applies exactly to bids between contractors and sub-bidders; and while work might be wanted so badly that the tendency would be to cut the price rather than lose the job, if it were a more general custom to insist upon adherence to the original bid, and the contractors knew they would be fairly treated in the matter, it is probable that every one would be better satisfied.

LIQUIDATED DAMAGES FOR BREACH OF CONTRACT.

A PROVISION in a contract for the construction of a residence that the builder, in case of non-completion of the house by a given date, should pay ten dollars for each day's delay, is a stipulation for liquidated damages. The failure of a subcontractor to fulfil his contract is no defense to the recovery of such damages. And where a builder agrees to construct a building by a certain date, which requires that it shall be done during winter months, the severity of the winter alone is insufficient as an excuse for failure to perform, if the work could have been carried on by the exercise of extra means or effort.—*Supreme Court, Washington.*

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK. — We have just entered upon the third month of our existence as Greater New York, and in view of the criticisms now being passed upon the "machine" administration, it is interesting to recall some of the public benefits dispensed by the recent "reform" administration.

It must surely be a matter of pride to us when statistics prove that our summer death rate has not been so low in twenty-five years as during the season passed. This is a more significant fact than would at first appear to one not familiar with New York, with its great cosmopolitan population and its crowded streets and tenements; and the unusual and vigorous effort to keep these streets and districts clean has been a most important factor in the saving of life, for which great credit is due to Col. Geo. E. Waring, upon whom the responsibility has rested. He organized and directed an army of men, dressed in appropriate uniforms, somewhat similar to the Parisian idea, and no expense or trouble was spared in having the work thoroughly done to the satisfaction of the public rather than the politicians.



RESIDENCES, NEW YORK CITY.
McKim, Mead & White, Architects.

Some of the worst slums on the East Side have been demolished and replaced by small parks.

Two recreation piers have been built and others are contemplated. These piers are two storied and are well patronized by those who are not fortunate enough to be able to take their families out of the city during "the heated term." Work has been commenced on the new North River Bridge, and land has been purchased for a second bridge over the East River, which will greatly facilitate communication between the various parts of the metropolis.

The post-office service has been greatly improved, the most recent innovation being the pneumatic tube mail carrier, which was tested last week and which proved eminently satisfactory.

The projected scheme of a tunnel connecting New York and New Jersey is being pushed, and we may confidently include this among the developments of the near future.

A great botanical garden is to be erected in Bronx Park, one of the most beautiful natural parks in the vicinity. This is a great work and will undoubtedly prove as popular as the gardens at Kew, England, which are visited by great numbers of people, sometimes hundreds of thousands in one day. The buildings will be laid out in such a manner as to carefully guard against destroying any of the natural beauty of the park. Over $500,000 will be expended. Drawings of some of these buildings will soon be reproduced in THE BRICKBUILDER.

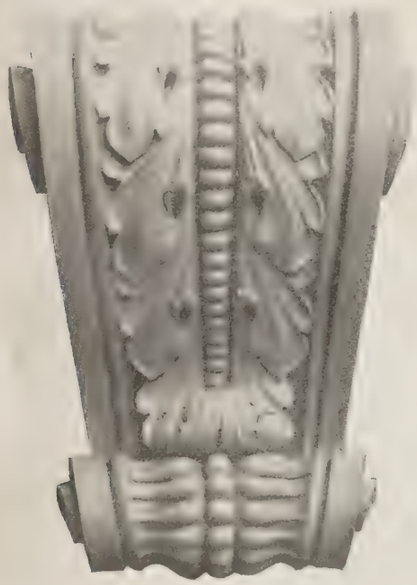
It will undoubtedly interest architects to know that a company has been formed which has for its object the sanitary and structural inspection of buildings. It makes examinations and reports on the condition of buildings and premises for owners, tenants, and intending buyers, lessees or mortgagees, and supervises the construction, maintenance, and repairs of buildings, entering into yearly contracts for these services. The idea has met with considerable favor in the city. The names of several architects of high standing who are interested in the venture is a sufficient guarantee of the integrity of the association.

Most of the necessary money has been raised for the proposed monument to the late Richard Morris Hunt which is to be placed in Central Park. The expense of the work has been generously met by contributions from those who knew Mr. Hunt, and who admired his personality, his generosity, and devotion to his profession, and his sympathy and helpfulness to young men. He was one of the founders and one of the most enthusiastic members of the Municipal Art Society, which has for its object the protection of the city against promiscuous gifts of statuary, etc., which, if worthy, are one of the most beautiful adjuncts to landscape architecture, but if not, are an eternal blot. Although still young, the society is highly respected, and has accomplished great good. We can only hope for the time when works of architecture will be tried by some such fire. At present the press nobly seconds the work of censorship in regard to monuments, etc., and people are beginning to discriminate between good and bad work; but criticisms in regard to works of architecture, infinitely more important and more lasting, are cautiously whispered, and the work goes on so that now one of the largest and most important office buildings in New York is the most offensive, and caused a well-known editor to remark in private, "If that building had been designed by a younger man it would have ruined him." Among recent items of news may be mentioned: James Brown Lord, architect, has prepared plans for a new building, to cost $35,000, for the New York Circulating Library. It will be erected on 100th Street, near the Boulevard. Clarence True, architect, has plans drawn for twenty-four five-story brick and stone dwellings to be built on Riverside Drive; Edward Wenz, architect, has prepared plans for a five-story brick flat building on 101st Street, near Columbus Avenue to cost $45,000; Raleigh C. Gildersleeve, architect, has plans drawn for a five-story stone and brick dwelling to be erected on Fifth Avenue near 77th Street; cost, $75,000.

Brite & Bacon, architects, have planned a five-story dwelling, to cost $100,000, to be erected on the corner of Fifth Avenue and 64th

Street; Richard H. Hunt, architect, has completed drawings for the new east wing of the Metropolitan Museum of Art, which will cost $800,000.

PHILADELPHIA.— The workings of the law permitting the supervising architect of the Treasury to give out government buildings amongst architects for competition have just had a practical demonstration here, and given general satisfaction. Some eight Philadelphia architects were invited and submitted designs for a Custom House and Post-Office, to be built in Camden, N. J., in compliance with a strictly business-like program of competition describing in an explicit manner the number of and space required by the various departments, offices, etc. The cost stipulated was liberal without being lavish, the ground for the proposed building large enough to admit of light on all sides, so it may be seen how interesting was the problem, and how it required but an honest judgment and award to place the competition amongst the best. The decision of the experts, of whom there were three, including Supervising Architect Taylor, seems to indicate that, to the end, everything had been carried out satisfactorily. The successful architects, Rankin & Kellogg, are to be congratulated on this the latest of their many successes in professional competitions. Their design shows a dignified building in the style of the Italian Renaissance, having a two-storied-columned portico with pediment in center of façade, remainder having balustraded skyline. It is to be entirely of white marble. It seems perhaps still a great waste of architectural skill to have so many designs thought out with the certainty that only one can be used, but it is a step much in advance to have competition restricted.



TERRA-COTTA KEY.
Executed by the New Jersey Terra-Cotta Company.
Shickel & Ditmars, Architects.

The buildings of the University of Pennsylvania have a peculiar interest to the architect in the variety of their building material. The old-time green-stone University Hall stands side by side with the bright red press-brick and terra-cotta of the library, and seemingly shelters by its towering mass the low-lying Huston Hall with its English-mullioned windows in light stone set in the gray stone of Germantown. Across the way are some buildings in dull rough-red brick and red terra-cotta, while further out is the beginning of the dormitory system in a quaint red brick with bright Indiana limestone lavishly used. Standing at the lately finished Dental Hall, by Edgar V. Seeler, in its rich, warm colors, the walls of the museum close by just being put, in part, under roof, seem composed of yellowish-gray materials. but only a closer inspection shows how curious is the composition. Two rough, small-sized bricks are placed end to end, without mortar, so as to resemble one long brick, then a black or purplish header separated by about 1½ ins. of cement mortar. All the horizontal joints are of this thickness of cement. The scheme of the bond is after that known as Flemish, with stretchers double the usual length. These abnormally wide joints take almost as prominent a part in the general color effect as the red brick, with the result, as before mentioned, of giving the wall a very light tone.

The architecture is Italian, one might even say from Bologna, with round brick columns with the caps to be found there, while some beautiful patterns of colored marbles, eminently Bolognese, are set into the brickwork, in the tympanum of the windows, and in the friezes under eaves; also, curiously enough, between first-story windows under piers of the second story. A domed central structure is to dominate the mass, but of this only the foundations are in,— wide foundations of brickwork, looking now like the ruins of some Roman palace.



PANEL, SPINGLER BUILDING, NEW YORK CITY.
Executed by the Excelsior Terra-Cotta Company.
W. H. Hume & Son, Architects.

PITTSBURGH.— The increase in building operations expected with the beginning of the new year does not seem to have begun as yet; architects report considerable small work in progress, but practically no large office or mercantile buildings definitely decided upon.

Within the past year Pittsburgh has suffered severely from fires. The Horne fire of last summer undoubtedly caused the greatest financial loss, but the Pike Street fire of last month probably nearly equaled it in this respect, and was, in addition, accompanied by a terrible loss of life.

The burning of the building occupied by the Edmunson & Perrine Furniture Store, and of the Union Trust Company Office shortly followed the Horne fire, while a nine-story building on Penn Avenue,



RESIDENCE, BROOKLINE, MASS.
Winslow & Wetherell, Architects.

near 9th Street, was burned in the same week in which occurred the Pike Street fire.

Among competitions recently held but not yet decided have been those for the new Union Trust Company Building; for a new school building in Ward 20; for the First United Presbyterian Church to be erected on Fifth Avenue, near the entrance to Schenley Park; and for the City Deposit Bank, at the corner of Penn and Center Avenues.

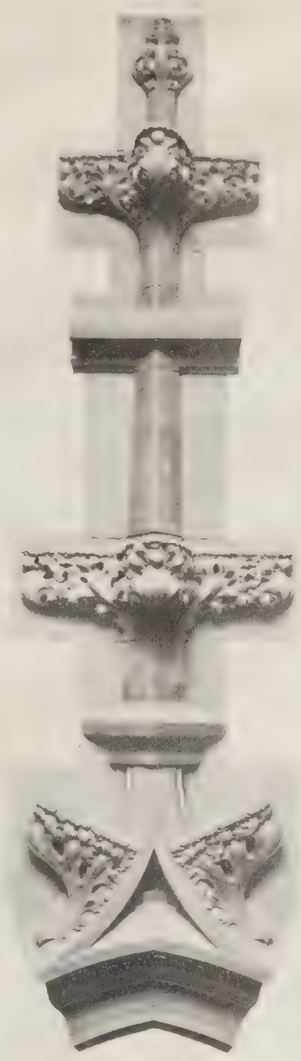
The design of F. J. Osterling for the new Court House at Washington has been accepted; it is estimated to cost about $500,000.

Work has been commenced on the new ten-story apartment house on Forbes Street opposite Schenley Park. It is intended to have the building completed in time for use as a hotel during the triennial conclave of Knight Templars to be held here in October next; Rutan & Russell are the architects. This firm is also at work on a new armory building for the National Guard of Pennsylvania, to be located on Bedford Street.

Pittsburgh contractors are proving that they can erect buildings with as great rapidity as those of any city.

Work was commenced on the eight-story office building for J. G. Murtland, at the corner of Sixth Avenue and Smithfield Street, about the middle of November. It is to be ready for occupancy April 1. It is built of buff pressed brick, terra-cotta, and sandstone. The department store for H. C. Rowe, at North Highland and Penn Avenues, was begun at about the same date and is to be finished the same time. Alden & Harlow are the architects of both.

The new Horne Building is nearing completion. When the old building was burned the steel frame and most of the terra-cotta floor arches remained in place. After a careful examination and test they were found uninjured and it was decided to use them again. Peabody & Stearns are the architects of the present store. These architects have also recently let the contract for a new market house in the East End. It is 170 by 270 ft., is to be built of brick and terra-cotta, and cost $150,000.



TERRA-COTTA DETAIL, ST. CHRISTOPHER'S HOUSE, NEW YORK CITY.

Executed by the Conkling, Armstrong Terra-Cotta Company.
Barney & Chapman, Architects.

BUFFALO.— The new year has opened with a much more favorable outlook than has been in evidence for a long time. On every hand we hear that there is to be a much better season. Prices of building materials are raised, and the class of buildings seems to have been elevated.

The increased price of material will help to throw out a good many of the speculative builders, who have done so much to pull down domestic architecture to the level it is now on.

Buffalo property seems to be gaining in popularity amongst outside investors, as during the past few months large blocks of real estate have been sold to capitalists in New York and Pittsburgh. The new owners express their intention of building soon.

The Pan-American Exposition is making great progress. Contracts have been let for several of the main buildings. These structures, though possessed of some architectural pretensions, are designed for manufacturing purposes. The capital has been advanced by various large concerns, who, after the exposition is over, intend to take over the whole affair; and with the advantages of having electric power so close at hand, there seems to be no reasons why this should not become a great manufacturing center. All the power used at the exposition will be obtained from the Falls.

The largest piece of work in hand to be mentioned is the 74th Regiment Armory. As was mentioned in a former letter, bids had been opened for a stone building, but as the amount ran over $100,000 above the sum given by the State, the specifications were revised. Bids were asked for on various kinds of material, stone and brick, with the result that the building will be of Medina stone, at a cost of $335,585. It was proposed to build entirely of brick, but there was a general outcry against this, as it was thought that the appearance of the building would be spoiled.

It is said that the Iroquois Hotel is to be raised from eight to twelve stories, and that the banquet hall will be placed on the twelfth story, and is to be surrounded by other smaller ones so planned that, by an ingenious arrangement of the architect, Mr. Aug. Esenweim, they can be thrown into one large hall. The rotunda will be finished entirely in Mexican onyx and marble.

The city has had still another experience in letting contracts to the lowest bidder.

Two schools were commenced last year, both given to one man, he being on the second school nearly 27 per cent. less than the next highest. When the bids were before the school committee, representations were made that he had failed to carry out other contracts and that various material men had liens on the property. However, the contracts were given him, with the result that the buildings have been liened upon, and that the city will finish them. The Bond Company found loopholes to escape from fulfilling their bond, one being that the city finishes the work; and as that appears to be the next move, the men who have liens on the property will doubtless lose their money, as, the work being for the city, liens have no force for material, but only for money due. People are wondering why the Surety Company is not being made to finish the schools.

LAND LIABLE WHERE BUILDING HAS BEEN DESTROYED.

WHERE the laws of a State give a lien on the buildings or structures, and on the interests of the owner in the land on which they stand, for work done and material furnished and used in them, on destruction of the building by fire before completion the lien may be enforced against the land on which it stood. — *App. Ct., Ind.*

TRADE PUBLICATIONS.

WE have so often been asked to publish a list of American brands of cement and the particular class of work that each brand is suitable for, that we take pleasure in calling the attention of our readers to a group of pamphlets just issued by the Commercial Wood & Cement Company, Philadelphia and New York. These pamphlets, of which there are four, relate to the brands of American cement for which this concern is agent, namely, Commercial Portland, Commercial Rosendale, Victor Portland, and American Portland. Each pamphlet contains an amount of data and general information pertaining to the particular brand which it represents, that makes it not only interesting, but instructive and otherwise valuable. The more important work in which the cement has been used is enumerated, often illustrated, within these pages. In the pamphlet devoted to the interest of the American Portland brand there is published a most interesting paper by W. W. Maclay, C. E., on the "Testing and General Qualities of Portland Cement, and some Rules for Using It so as to Get the Best Results."

Copies of these pamphlets may be had by applying to the Commercial Wood & Cement Company, 156 Fifth Avenue, New York.

The Use of Terra-Cotta for Interiors.

WE have recently received a few samples of terra-cotta work from Fiske, Homes & Co., Boston, which we think deserve more than passing comment.

Terra-cotta for the exterior construction of buildings long ago took its place as one of the most desirable materials.

The construction and decoration of the interior of the modern



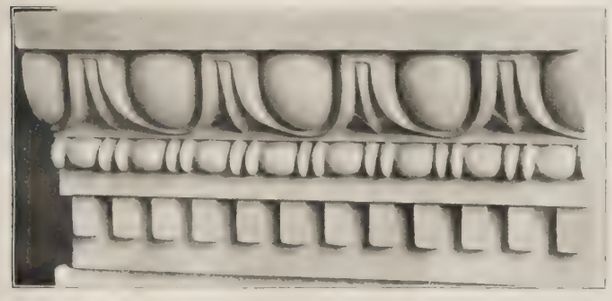
home is, however, something of quite a different order, and requires a class of goods distinctly superior, in nicety of workmanship and careful selection of color, to those employed on the exterior.

In interior work, the structure is of comparatively small size, requiring ornamentation of low relief; the eye, being close to the work, is offended by the boldness and roughness which characterizes exterior designing, while jointing entirely suitable for exterior work appears crude when used on the interior.



Terra-cotta manufacturers have, as a rule, confined themselves to a grade of work suitable for exterior, and the architect and builder have, therefore, not found it desirable to use it extensively inside the building. Such a state of things is not necessary, *per se*, as the delicate product of the modern pottery bears evidence to the fact that burnt-clay products are capable of the finest workmanship.

Why a similar refinement should not be obtained in interior terra-cotta, thus combining the nicety of marble, *papier maché* ornamentation, or even woodwork, with the beautiful blending of colors obtainable only in clay products is a question which we cannot understand; and we believe, when the terra-cotta manufacturer realizes the fact that his work must take its place as a part of the interior



furnishings of the room and produces work capable of such use, that it will be gladly accepted by the architect and builder.

The samples of interior terra-cotta illustrated herewith seem to us to be a decided step towards the realization of that perfection which we mention above. This work is produced for use about the fireplace, where bricks have been used from time immemorial, but where there has been a lack of proper clay products for ornamentation. The features which have prevented the universal adoption of brick mantels have been their crudeness of design and roughness of construction. Architects have been accustomed for years to overcome the former difficulty by making their own designs, but have experienced delays of manufacture, uncertainties of color, as well as great expense in the execution of this special work.

Could the architect feel sure of obtaining a good design, executed promptly from stock patterns, and with that certainty as to the nicety of workmanship and color demanded by interior conditions, it seems to us that clay products would be recognized as the most satisfactory in every way for fireplace construction.



These conditions seem to be realized by the work illustrated herewith to a remarkable degree. Not only are the designs good in arrangement and proportion of parts, but the modeling is done with special delicacy and refinement of lines not possible or even desirable for exterior work. The modeler seems to have kept before him the fact that the same perfection is demanded and should be realized in the fireplace as in the woodwork and *papier maché* ornamentation on the walls and ceilings, and even the furniture that stands around the fireplace. The edges are straight and true; the pieces are sufficiently uniform in color and size to enable the use of narrow joints and correct lines through the entire structure, thus largely obviating that crudity in appearance that has been characteristic of such work in the past.

All of the ornamentation of these mantels, where possible, is produced by terra-cotta rather than molded bricks.

Messrs. Fiske, Homes & Co. are well-known terra-cotta manufacturers of long experience, and they appear to have attacked the fireplace question as such rather than as brickmakers.



We believe they have contributed a valuable addition to the desirable materials for interior decoration and have given a new impetus to burnt clay on the inside of the modern house.

CURRENT ITEMS OF INTEREST.

R. GUASTAVINO Co. have removed their Boston office to 19 Milk Street, Room 53.

WALDO BROS. will supply Atlas Portland cement for draw pier, Charlestown Bridge, Boston; Perkins & White, contractors.

CHARLES TAYLOR'S SONS, Cincinnati, Ohio, manufacturers of enameled brick, fire brick, etc., are in the market for a clay disintegrator.

WHIDDEN & COMPANY have awarded the cement contract for foundation for new Boston Electric Light Company Plant to Waldo Bros., specifying Atlas cement.

JOHN W. HAHN, 166 Devonshire Street, has been appointed Boston agent for the American Enameled Brick and Tile Company, of New York.

WALDO BROS. will supply Atlas Portland cement to the Hartford Paving & Construction Company for government work at Fort Constitution, N. H.

THE POWHATAN CLAY MANUFACTURING COMPANY will supply 75,000 of their cream-white bricks for the new building which is to be erected at Richmond, Va., as a Home for Incurables.



TERRA-COTTA DETAIL, BRAZIER BUILDING, BOSTON.
Executed by the Northwestern Terra-Cotta Company.
Cass Gilbert, Architect.

THE Scollay Square station of the Boston Subway will be lined with enameled brick made by the American Enameled Brick and Tile Company, of New York; Norcross & Cleveland are the builders.

THE AMERICAN ENAMELED BRICK AND TILE COMPANY have closed a contract with Norcross Bros. for supplying the enameled brick that are to be used in the immense new Southern Terminal Station at Boston.

THE INDIANAPOLIS TERRA-COTTA COMPANY report a good spring business. They are now engaged on contracts for new work in Toledo and Cincinnati. The terra-cotta for the Edison Electric Light Company's new building in the latter-named city will be furnished by them.

THE BRICK TERRA-COTTA AND SUPPLY COMPANY, Corning, N. Y., are furnishing the architectural terra-cotta required for the Fourteenth Ward School building, Syracuse, N. Y., M. D. Makepiece, architect.



TERRA-COTTA DETAIL, BLIND ASYLUM, OVERBROOK, PA.
Executed by the Burlington Architectural Terra-Cotta Company.
Cope & Stewardson, Architects.

THE BRISTOL AND PLAINVILLE TRAMWAY COMPANY are erecting near Plainville, Conn., a new substantial steel bridge, having a span of about 90 ft. The bridge has been designed with a view of being a permanent structure, well able to take care of the increasing and heavy traffic of the road. It has been furnished and is now being erected by the Berlin Iron Bridge Company, of East Berlin, Conn.

THE NEW JERSEY TERRA-COTTA COMPANY has closed contracts for furnishing the following buildings with terra-cotta: Residence and carriage house, Islip, L. I., Lawrence Birdsall, architect; school, Cranford, N. J., Ackerman & Ross, architects, Peter Tostevin's Son & Co., builders; offices, 66th Street and Columbus Avenue, New York City, Neville & Bagge, architects, Robinson & Wallace, builders.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., are building a new boiler-house roof for the Coe Brass Manufacturing Company, at Ansonia, Conn. The Hartford City Gas-Light Company, of Hartford, Conn., have placed with them an order for one of their steel roofs lined with their patent anti-condensation fire-proof roof lining, which has given such eminent satisfaction in the past.

THE RIDGWAY PRESS-BRICK COMPANY, Ridgway, Pa., have closed the following new contracts for supplying their bricks: 40,000 light mottled Romans and 3,000 dark mottled Jack arches for Harre Robbins's residence, Pittsburgh, S. F. Heckert, architect; sale made by Jas. R. Pitcairn, Pittsburgh representative; 200,000 vitrified gray standards and 2,000 vitrified gray bull noses; power plant for Northwestern Mining and Exchange Company, Brockwayville, Pa.; 100,000 vitrified buff brick for factory building for Wilcox Manufacturing Company, Wilcox, Pa.



TERRA-COTTA KEY, ST. JAMES BUILDING, NEW YORK CITY.
Executed by the Perth Amboy Terra-Cotta Company.
Bruce Price, Architect.

THE CLINTON METALLIC PAINT COMPANY, of Clinton, N. Y., are sending out in little white enamel boxes, scarcely larger than a postage stamp, samples of Elastic Silk Fiber Roof Cement. This is said to be a strictly up-to-date article, combining unusual elasticity with adhesiveness, and a special value is given to it from the peculiar fiber it contains. Its qualities admit of its working in any climate, and on either metal, slate, or glass, and the white enamel boxes which the Clinton Company are sending out are a unique departure in sampling, in the roof cement trade, at least.

FROM building reports which have recently come to hand it is noticeable that Powhatan white bricks are to be used liberally in New York building operations. Among the buildings which are to be constructed of these bricks are: The new Hall of Education; apartment houses on 87th Street west of Park Avenue; building corner 92d Street and Madison Avenue, N. L. & L. Ottinger, architects; new building for the Knickerbocker Realty Improvement Company, 116 West 34th Street; new building on 125th Street near Amsterdam Avenue, Pollard & Steinam, architects; new building at 3d Street and Avenue C, Harry McNally, architect.

THE product of the American Mason Safety Tread Company is being specified for use in a very large proportion of the buildings now in the hands of Boston architects. The Safety Tread is to be placed upon the stairs of the Southern Union and Dartmouth Street railroad stations Shepley, Rutan & Coolidge, architects; the new building of the Massachusetts Institute of Technology, E. B. Homer, architect; the Paul Revere School, Peabody & Stearns, architects; the West Roxbury High School, Andrews, Jaques & Rantoul, architects; the East Boston High School, J. Lyman Faxon, architect; Melrose High School, Tristram Griffin, architect; the Brayton Avenue School, at Fall River, A. M. Marble, architect; school at East Douglas, Clarence P. Hoyt, architect; Massachusetts Eye and Ear Infirmary, Shaw & Hunnewell, architects; Masonic Temple, Loring & Phipps, architects; large buildings of the Boston Real Estate Trust on Beach Street and of the Francis estate on Chauncy and Avon Streets, Winslow & Wetherell, architects; India Street building, Alex. S. Porter, Trustee, Charles E. Park, architect; India Street building, John D. Long, Trustee, Rand & Taylor, Kendall & Stevens, architects; and several other large buildings for mercantile uses. The approval of the Mason Safety Tread by Prof. F. W. Chandler for use in the Institute Building, and, as consulting architect for the city of Boston, for the important new public school buildings, is significant of the favor with which this modern protective device is received by professional men of the highest standing.

A NEW and beautiful thoroughfare has been added to the several leading to Thomas Park and Dorchester Heights, Boston, which is not only in keeping with the general surroundings, but adds greatly to this beautiful spot, says the Boston *Herald.*

This new thoroughfare is to be known as Covington Street, and its unique construction and general appearance for a thoroughfare make it something of a curiosity, as regards the laying out and construction of public thoroughfares.

It shows that although a grade may be very steep, it is possible to overcome it, as far as pedestrians are concerned; for this new street is constructed with artificial stone blocks arranged in a series of flights of steps, with a broad landing of the same material between each flight, making it easy and convenient to surmount.

In starting the work, flights of steps were cut out of the earth embankment. These steps were then covered with a surface of broken stone and cement, so that when the stone steps should be placed in position it would be impossible for any damage to result from cold or frost.

There are seven flights of stairs containing nine steps each, and between each flight is a landing about 6 ft. long and 12 ft. wide, the entire structure being constructed of artificial stone composed of crushed granite and cement.

The W. A. Murtfeldt Company, of Boston, did the work, and the cement used by them was the Dyckerhoff brand.

WANTED,

For New York or Western office, a couple of strictly A1 draughtsmen, one good free-hand sketcher, designer, and water colorist; also good man for working drawings and details. Must be rapid, accurate, and capable. Permanent positions to right men. Address, stating salary expected, W. J. KEITH, Architect, Minneapolis, Minn.





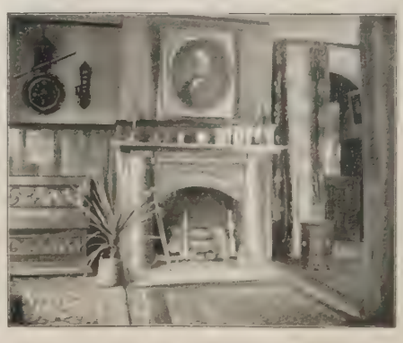


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YOST & PACKARD, ARCHITECTS, COLUMBUS, OHIO.

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THE DELMONICO BUILDING, 44TH STREET AND FIFTH AVE., NEW YORK CITY.

JAMES BROWN LORD, ARCHITECT.

TERRA-COTTA AND BRICK BY THE

NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY,

PHILADELPHIA. 38 PARK ROW, NEW YORK CITY. BOSTON.

VOLVME VII APRIL 1898 No. 4

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

ROGERS & MANSON,

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EPHEMERAL CONSTRUCTION.

IT is always difficult to properly measure the results of effort of the passing generation. The nearness of view is a bar to clear perspective values, and we cannot properly compare the present with the past or even foretell future developments with any very great surety. At the same time we believe that certain general tendencies are not difficult of measurement even while in process of evolution, and the signs of the times certainly seem to indicate that we are about to begin a period of vast extension in building, or perhaps more properly in architecture. For a number of years now this country has been passing through a financial depression, and that, together with the imminence of war on our very borders, makes the prospect seem gloomy. There is, however, a fair evidence that we are preparing the way for architecture of a kind and on a scale in advance of anything that has gone before. It is only within a comparatively few years that our methods have been such as to admit of real permanence in our constructions. The fire-proofing systems, which are still so young in years as to have hardly attained a majority, have enlarged the possibilities for a degree of permanence which did not exist during the previous generation; and, more than that, we as a people have been awakened to the commercial value not only of good construction but of good looks, and it is believed that when the country has righted itself from the political troubles through which it is now passing and has regained a measure of its native buoyancy we will be ready to construct buildings which will be free from the ephemeral character of most of our recent public works.

The greatest building epoch which the world has ever seen was undoubtedly that which culminated during the first century after Christ, under the sway of the Roman emperors. The architecture produced at this period was characterized more than in any other way by the solidity, the enduring qualities of its construction. Other periods of art have far excelled it in pure art and esthetic perceptions, but the world to-day owes its best constructive ideas to the Romans. Unless we greatly misinterpret the signs of the times, the next quarter century will witness a very widespread return to some of the methods which marked the more important Roman buildings, and especially in the construction of walls and vaulted surfaces there is reason to believe that we are developing into a permanence of construction which will augur well for the possibilities of artistic growth. If any one were to visit a huge structure such as the new South Union Station, now in process of building in this city, an edifice which, taken altogether, is one of the largest which has ever been conceived by human thought, it would seem as if we were in the midst of an iron age, as if steel in its various forms was the important element in our buildings, as if it had come to stay, and was not only indispensable, but was unreservedly approved of by our constructors. Steel and its possibilities have undoubtedly increased the horizon of the architect and have added enormously to the possibilities of construction, and yet we question very often whether in an architectural and constructive sense we have not lost rather than gained by the use of this extremely adaptive material. A wall of huge solid masonry construction seems clumsy and antiquated by comparison with the slender shafts which we find in the basements of some of our tallest buildings, and the whole character of our streets has been changed very materially in the more recent constructions by the possibilities of steel. We will venture the broad assumption that aside from the question of pecuniary gain or commercial necessity there is not one thinking architect in ten who would not prefer to construct of solid masonry from foundation to garret rather than to, of his own choice, select the spider-like constructions which we seem obliged to resort to; and from a standpoint of architecture the constructive values of steel are but a poor compensation for the manifest deficiency of our public buildings in those qualities of breadth, solidity, and permanence which contribute so largely to the success of the old Roman work.

A love for the massive constructions of antiquity does not, however, oblige us to imitate them literally. The Romans used brick and concrete as brute materials which would overcome the thrusts of vaults and arches to such an extent that such things as iron ties or bands were not required, and the actual factor of safety in nearly all the Roman work is, therefore, so far in excess of anything which scientific construction would call for that the same results, namely, stability and permanence in appearance, could be obtained in modern work with far less sacrifice of space and internal arrangement. The very able article by Professor Baker, the first instalment of which appeared in the last number of THE BRICKBUILDER, is a move in the right direction towards the increasing of the possible reliance which can be placed upon good masonry. As the article very justly intimates, a brick pier or wall crushed by superimposed load is so rare a circumstance as to be almost unrecorded. We trust good masonry less than about any other material which is used in building.

The buildings erected from the designs of the late H. H. Richardson are preeminently characterized by the appearance of extreme solidity and permanence, though we imagine that Mr. Richardson

was by no means ahead of his generation in his knowledge of constructive values. In one of the largest of his structures he had planned for a brick pier to support a load running up into hundreds of tons. The builder, who was a cautious as well as a thinking man, after putting up the pier and imposing the load upon it, became alarmed at the size in proportion to the load, and, finding that the brickwork was loaded with something over 25 tons per foot, without saying anything to anybody made some experiments. He built a brick pier and proceeded to undertake to crush it, but he found the resistance so great that before it began to show any signs of weakness whatever he gave it up, and was perfectly satisfied that the pier as designed by Mr. Richardson was ample for the purpose, notwithstanding it was loaded with nearly twice as much as any of our building laws would permit. Since then he has always been a firm advocate of the strength of brickwork when properly laid.

We do not need the heavy constructions of the Romans, but we do need the solid character, and that character is only simulated by the use of steel. Furthermore, we feel that with the blessings of peace, and the consequent expansion of our industries and our wealth, we shall see an era of public building such as has never visited this country before, and it looks as if we would be ready for it with methods and ways of building which will give us the right to rank our buildings with the creations of the past which have survived for us. We do not consider a building in Europe which is a couple of centuries old as in any sense wearing out, and yet the average life of our structures here has been up to the present from thirty to forty years. This is not simply because methods of planning have changed, for we are using very largely the same methods that were followed in the time of the Renaissance, and, barring certain questions of practical interior arrangements, some of the old Roman and Florentine palaces could to-day be utilized, with very slight change, for a modern office structure. Consequently the short life of our modern buildings is not due to inadaptability so much as to the innate nature of our constructive methods.

A CORRECTION.

In the March issue of THE BRICKBUILDER there was illustrated a residence at Brookline, Mass., of which Henry Forbes Bigelow, Boston, was the architect. By mistake, the names of Winslow & Wetherell, were given as being the architects.

PERSONAL AND CLUB NEWS.

PARISH & SCHROEDER, architects, have removed their offices to the Bancroft Building, 3 W. 29th Street, New York City.

FRED M. TRUEX, architect, has opened an office at Red Bank, N. J. Catalogues desired.

THE firm of Wagner & Reitmeyer, architects, Trust Building, Williamsport, Pa., has been dissolved. Mr. Wagner will continue the business of the old firm.

ROBERT S. SOULE, architect, has opened an office in the Hennen Building, New Orleans. Catalogues and samples desired.

D. M. COLLIER, architect, has opened an office in the Lennon Building, Oneonta, N. Y. Catalogues and samples desired.

THE office of James Craddock, architect, Lincoln, Neb., was recently burned out. Mr. Craddock has opened an office in the Oliver Theater Building, and would be glad to receive catalogues and samples.

A COLLECTION of paintings by a group of American artists was exhibited at the St. Louis Museum of Fine Arts on the evening of March 29, and on the evening of April 12 there was shown a collection of paintings and drawings illustrating scenes of the Revolution, and also a collection of Favrile glass.

THE St. Louis Architectural Club held its regular monthly meeting on the evening of March 12 in their new quarters at 916 Locust Street. Drawings in their regular monthly competition were submitted, the subject being an engine house. First prize was awarded to Benno Jensen; Mr. Farberger, second mention; J. C. Stephens, third. J. W. Ginder and R. M. Milligan acted as judges. The problem for this month is a house for the club. In addition to this, Mr. E. Lasser has offered a prize for the best design for a horse stall in iron.

A REGULAR meeting of the T Square Club was held on Wednesday evening, March 16. Mr. Louis C. Hickman spoke on the subject of the "Planning of a City Residence," and made some interesting observations on the possibilities of originality in such planning.

The subject for competition for the evening was "The Façade of a City Residence," *apropos* of which were Mr. Hickman's remarks. First mention was awarded to Horace H. Burrell; second mention, to Edward Gilbert; and third mention, to W. C. Scheetz.

A Club Smoker and Special Competition in Decoration was also held on March 2. First mention was awarded to Nicola d'Ascenzo; second mention, to Horace H. Burrell. Mr. Frank Miles Day led the criticism on the drawings submitted, and also gave an informal talk on the New Congressional Library at Washington.

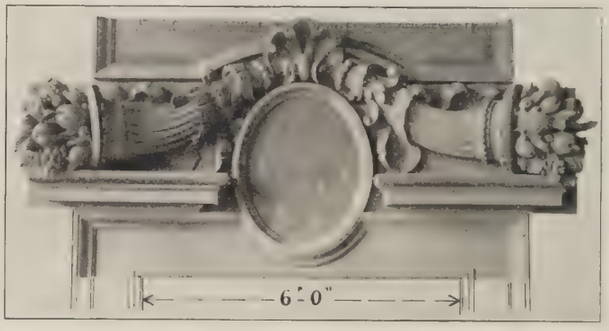
ILLUSTRATED ADVERTISEMENTS.

THE Commercial Cable Company's building, New York, Harding & Gooch, architects, is illustrated in the advertisement of the Excelsior Terra-Cotta Company, page iv.

The Phœnix Mutual Life Insurance Company's building, Hartford, Conn., Cady, Berg & See, architects, is illustrated in the advertisement of the New Jersey Terra-Cotta Company, page viii.

Number ten of the series of Brick and Terra Cotta Fireplace Mantels, of which J. A. Schweinfurth is architect, is illustrated in the advertisement of Fiske, Homes & Co., page vii.

A residence at Baltimore, J. A. & W. T. Wilson, architects, is illustrated in the advertisement of Harbison & Walker Company,



DETAIL BETWEEN SIXTH AND SEVENTH STORY WINDOWS, HOTEL MARTINIQUE, NEW YORK CITY.
Terra-cotta and brick by the New York Architectural Terra-Cotta Company.
H. J. Hardenbergh, Architect.

page xv. This building has been shown previously in this advertisement, but by mistake was titled a residence at Pittsburgh, Pa.

The basement floor construction of the American Soda Fountain Company's new building, Boston, Kendall, Taylor & Stevens, architects, is shown in the advertisement of R. Guastavino, page xxiv.

The Bank of Commerce Building, New York City, James Barnes Baker, architect, is shown in the advertisement of Henry Maurer & Son, page xxv.

The New Hospital Building at Eastern Ohio Asylum for the Insane, Massillon, Ohio, Yost & Packard, architects, is shown in the advertisement of the Celadon Terra-Cotta Company, Charles T. Harris, Lessee, page xxix.

The new Delmonico Building, Fifth Avenue, New York City, James Brown Lord, architect, is shown in the advertisement of the New York Architectural Terra-Cotta Company, page xxx.

The American Schoolhouse. VI.

BY EDMUND M. WHEELWRIGHT.

MR. WILLIAM ATKINSON writes concerning his plan published in the March paper of this series: —

"The plan is an attempt to reduce an eight-room schoolhouse to its lowest terms; in other words, to arrange four schoolrooms and four wardrobes on each floor, in the most compact manner possible.

"As an example of the economy of floor space attained in this plan, take the second floor. On this floor only 23 per cent. of the total area is devoted to hallways, stairways, heating and ventilating flues, and thickness of walls and partitions, or, in other words, 77 per cent. of the whole area is actually utilized.

"The following fixtures will illustrate this point: —

Area of building (53.9 by 92.3)	4,974.97 sq. ft.
This area is made up as follows, on the second floor: —	
Four class rooms at 768	3,072.00 sq. ft.
Four wardrobes at 117.8	471.20 sq. ft.
Two teachers' rooms at 100	200.00 „ „
Total utilized area (77 per cent.)	3,743.20 „ „
Space occupied by halls, stairs, flues, walls, and partitions (23 per cent.)	1,231.77 sq. ft.
	4,974.97 „ „

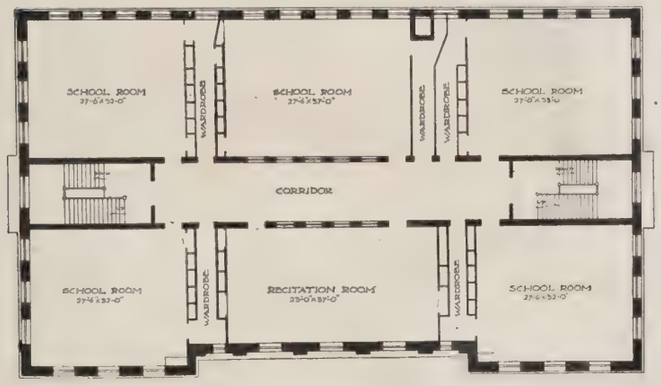


GILBERT STUART SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.

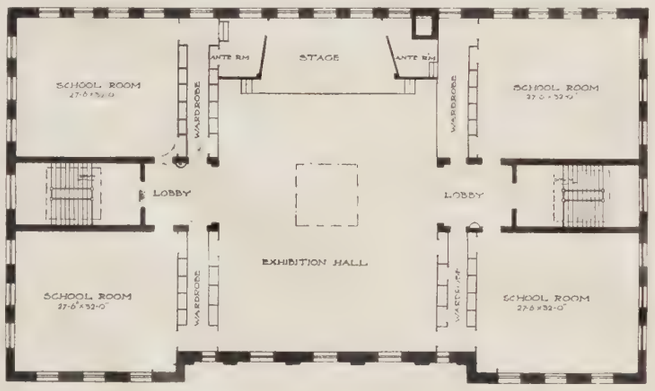
"In schoolhouse plans of the ordinary elaborate type, in which large areas are devoted to hallways, corridors, and passages, it often happens that less than 50 per cent. of the total area of the plan is utilized in rooms actually devoted to the purposes of the school.

"The amount of money to be spent in floor space devoted to hallways and corridors is a question for school committees to decide in any given case. This plan, as stated above, is an attempt to get the thing down to its lowest terms.

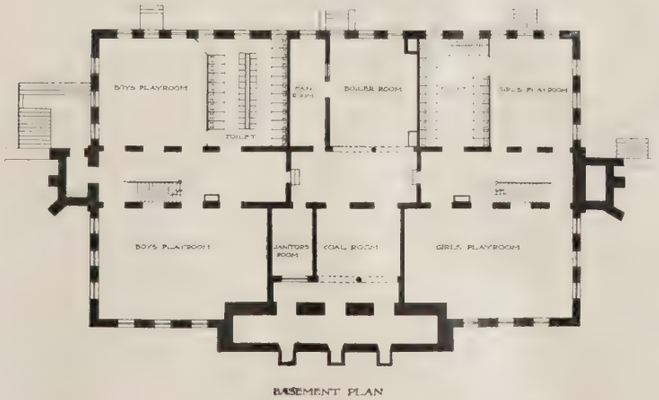
"One important feature of this plan is in the location of the stairways, which are placed at opposite ends of the building and in *separate* hallways not connected with each other, so that if one hallway should become filled with smoke, in case of fire, the other hallway would still give a safe way of egress to the inmates of the building.



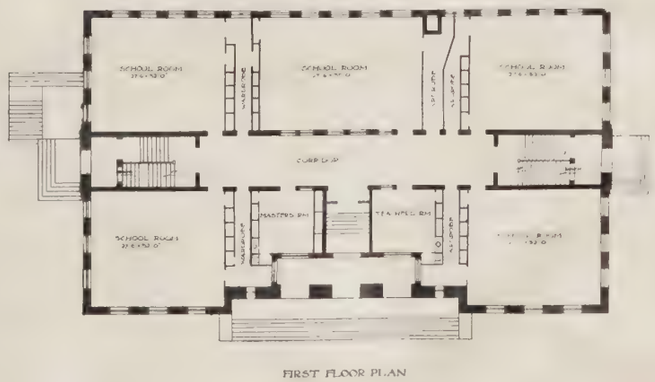
SECOND FLOOR PLAN



THIRD FLOOR PLAN



BASEMENT PLAN



FIRST FLOOR PLAN

PLANS, GILBERT STUART SCHOOL, BOSTON, MASS.

"This plan attains an economy of construction, as compared with the ordinary type of plan, in the following ways: —

"1. By a reduction of area, as explained above.

"2. By a reduction in the amount of interior partition wall.

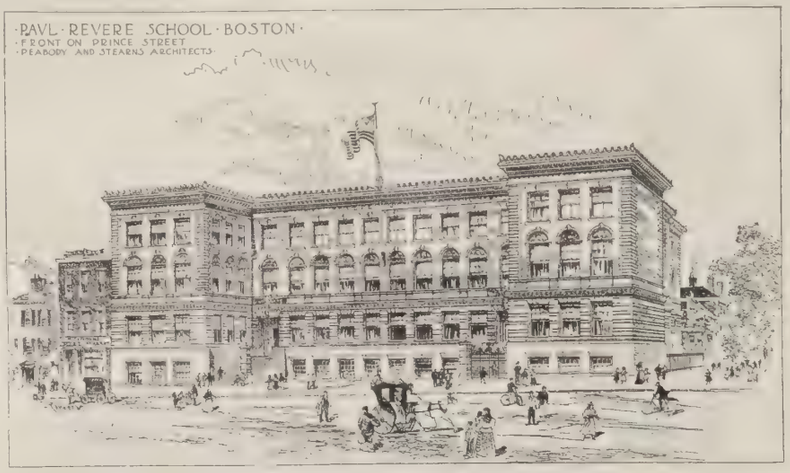
"3. By a reduction in the height of the building obtained by reducing the thickness of the floors and by running the windows clear up to the ceiling.

"4. By a reduction in cubical contents by the use of the flat roof.

"5. By eliminating cut stone as far as possible.

"6. By simplicity of construction.

"The main proposition of my father's pamphlet is that an eight-room schoolhouse of two stories and a basement, with class rooms of the ordinary dimensions (28 by 32), may be planned to cover a ground area of not over 5,734 sq. ft., and that such a building ought not to cost over $30,000 complete, including grading of lot and architect's commission. This proposition was arrived at by theoretical reasoning.



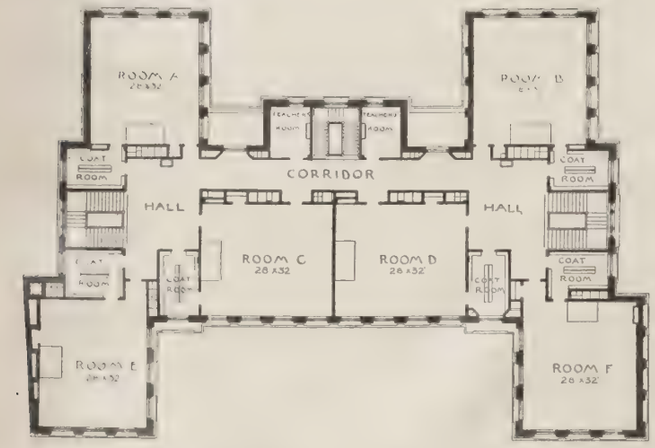
"It has been my purpose in working out these plans to show that the proposition is a sound one, and capable of being demonstrated in practical form.

"My plan with rooms 28 ft. wide instead of 24 would cover a ground area of 5,713.37 sq. ft., substantially the same as the hypothetical figure given in the pamphlet. This shows that the first part of the proposition is correct. And from estimates which I have made I am satisfied that the plans as shown (but with class rooms 28 instead of 24 ft.) could be executed complete for considerably less than $30,000 in the vicinity of Boston."

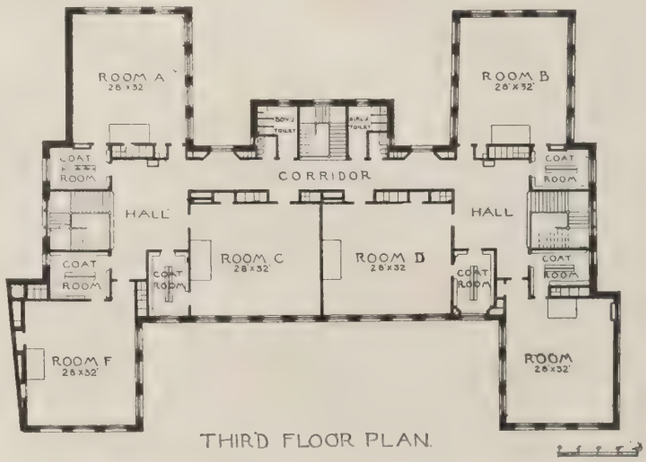
My opinion in regard to Mr. Atkinson's proposition is so fully given in my last paper that further discussion of the subject appears to be unnecessary.

As a result of the consideration of schoolhouse costs, previously given in these papers, the following general conclusions may be drawn: —

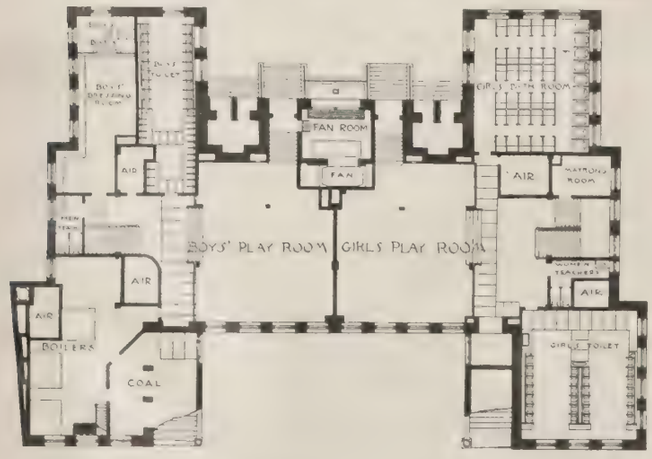
The addition of a schoolroom would appear to decrease the



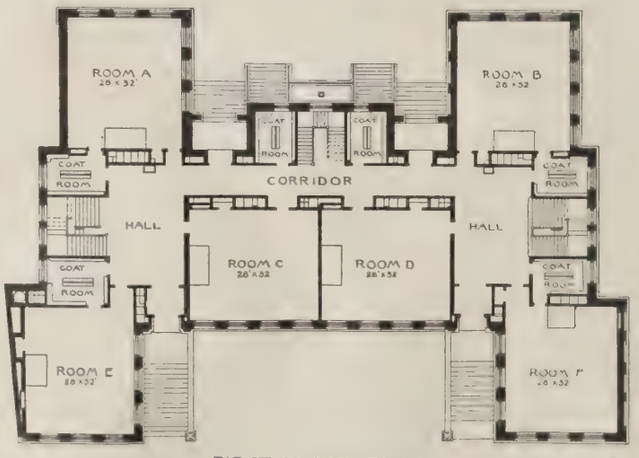
SECOND FLOOR PLAN



THIRD FLOOR PLAN



BASEMENT PLAN



FIRST FLOOR PLAN

PLANS, PAUL REVERE SCHOOL, BOSTON, MASS.

cost of a schoolhouse by about 2 per cent. The percentage of decreased cost will probably be less in buildings in excess of sixteen-schoolroom capacity.

Given an equal number of rooms, the cost of a grammar schoolhouse is 4 per cent. greater than that of a primary school.

The same accommodation can be given at 15 per cent. less cost in a three-story than in a two-story schoolhouse.

Separate wardrobes adjoining schoolrooms, increasing the cost of schoolhouse 4 per cent. over the cost of buildings of same number of rooms in which the clothing is hung in the corridors.

An increase of 4 ins. in one thickness of brick walls increases the cost of schoolhouse construction about 4 per cent.



CAMBRIDGE HIGH SCHOOL, CAMBRIDGE, MASS.
Chamberlin & Austin, Architects.

Leaving out of consideration any additional thickness of brick walls which may be entailed thereby, the cost of double run of sash in schoolrooms increases the cost of schoolhouses about 1¼ per cent.

The unusually severe requirements of the Boston Building Laws as revised in 1892 increased the cost of schoolhouse construction fully 9 per cent. without compensating advantage. The floor, for instance, had to be constructed to carry a live load of 150 lbs. per square foot in addition to the weight of the floor itself. This condition alone increased the cost of construction of Boston schoolhouses 2½ per cent.

When the Boston Building Law was further revised in 1897 and it was required that all schoolhouses should be of "fire-proof" construction, no change in this requirement of excessive strength of floors was made.

Previous to the passage of this law but two schoolhouses had been built in Boston with fire-proof floors, the Latin and English High and the Andrews School. The fire-proof floors in the Andrews School increased the cost of construction about 20 per cent. The Andrews School building was a nine-room, three-story, primary schoolhouse with roof of wooden construction. If such a building were built to-day with roof as well as floors of steel beam and terra-cotta arch construction, the cost would probably have been increased about 25 per cent. above that of a building of the same grade and size but with floors and roof of wooden construction.



ENTRANCE, CAMBRIDGE HIGH SCHOOL.

The Gilbert Stuart Grammar School, built with floors and roof of wooden construction, cost $6,193 per schoolroom. It is a fourteen-schoolroom building with assembly hall. It is probable that if of fire-proof construction throughout, its cost would have been increased 22 per cent., or to $7,555 per schoolroom. Leaving out of consideration the cost of plumbing and heating, the cost per schoolroom of such a building of fire-proof construction would have been $6,855 per schoolroom.

Since the construction of the Latin and English High School, which was completed in 1881, the Paul Revere School is the first wholly fire-proof school building built for the city of Boston. It is an eighteen-room building costing $152,406, or $8,488 per schoolroom. Since the plumbing was more elaborate in this building than in any previous school, bath rooms being here provided, we find that if the plumbing, together with the heating, is deducted, the cost per schoolroom was $7,322. The Revere School was lighted by electricity, the Stuart School was not; the Revere School had upon the stairs Mason Safety Treads in place of rubber mats, and had oak instead of ash finish. These features probably increased the cost above that of Stuart School about $200 per schoolroom. It is reasonable to suppose that the more elaborate external treatment of the Revere School rendered the building 3 per cent., or $350 per schoolroom, more expensive than the Stuart School. On account of the restriction of the site the cost of the Revere School was increased by the necessity of adopting a broken plan so that proper lighting might be given to the schoolrooms; we certainly may judge that this increased cost was $5,000 above that of the Stuart School. This amount would fully account for the remaining difference of cost between the two schools, if we consider the Stuart School as being of fire-proof construction and costing $6,855 per schoolroom, with heating and plumbing not included.

It would appear from the above conclusions that under ordinary conditions of site and architectural treatment, the excess of cost of fire-proof construction above that of buildings constructed under the Boston Building Laws of 1892 would be about 22 per cent., *i. e.*, a building of the form and architectural treatment of the Stuart School can be built in Boston of

fire-proof construction, with heating, ventilation, and the customary plumbing, for $7,555 per schoolroom, and that it may be safely reckoned that an equally well-finished and appointed building, constructed in a perfectly safe and satisfactory manner, but of less expensive construction than is permitted by the present Boston Building Laws can be built, including plumbing and heating, for about $6,800 per schoolroom, or for but about $600 more per schoolroom than if constructed with wooden floors and roof under the requirements of existing building laws.

Consideration of the relative decrease in cost of school accommodations due to the size of building and to the use of three instead of two story buildings, leads to the conclusion that if the demands for school accommodation under the best hygienic and structural conditions are to be met with due consideration for economy, that instead of small two-story, large three-story schoolhouses should be built, that school buildings should not be less than three stories in height, that they should not contain less than the equivalent of sixteen rooms, and that where fire-proof construction is required, schoolhouses should not be less than four stories in height.



WILLIAMS SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.

The schoolhouses lately constructed in New York City are built in accordance with the policy which should maintain in our large cities, if public education is to be given to our quickly increasing population without imposing an unfair burden upon the community. In that city the schoolhouses recently constructed are large fire-proof buildings of several, in some cases seven, stories in height. These later New York buildings are so important that they will later be given extended mention in these papers.

It is not only in New York that the method of economically meeting the needs of schools constructed in accordance with the most approved conditions has been adopted. We find that a like policy maintains in the country towns of New England. The system of small district schools is being abandoned in these towns, large school buildings are being built at convenient centers, and thus the benefit of better conditions in school construction are gained at, I believe, no greatly increased cost per pupil, even though the towns pay for the transportation of children living at long distances from the schools.

Although generous appropriations are made in our large cities for school buildings, there is generally complaint of insufficient accommodation for the school children. If building laws are not made needlessly severe, and if large buildings of three or more stories in height are more generally constructed, this condition need not exist. The disadvantage of long flights of stairs for children to climb is largely one of the imagination. This inconvenience can in great measure be obviated by the introduction of elevators, and by the utilization of the roofs for the playground of the children assigned to the schoolrooms of the upper stories. Roof playgrounds are an interesting innovation in school planning lately adopted in the New York City schoolhouses.

The rapid increase of population is often found to soon render small schoolhouses inadequate for the accommodation of the children of the neighborhood they were originally designed to serve. It should be borne in mind that with these small schools not only is the cost per schoolroom fully 20 per cent. greater than in the large three-story schools, but that the cost of grading, paving, and fencing, and the cost of janitor service and fuel, is relatively greater per pupil.

Too often saving in cost is made at the expense of truly economical and safe construction. In one large Ohio city where those in authority pride themselves upon the low cost of the schoolhouses, I found a building, four stories in height with stud interior partitions, furred walls, and no fire stops. It was unprovided with metal or brick ducts for ventilation. The foul air was supposed to find its way through the hollow spaces in floors and walls to the outer air. A more imperfect system of ventilation and a more ingenious fire trap than this method of construction could not well be devised. The rough surface of sawed lumber and the backs of plastered surfaces gave ready lodgment for dust, and the uncertainty of the direction of the air under such conditions gave no warrant that this dust was not breathed in by the occupants of the building.

It is hoped that members of school committees and others interested in schoolhouse construction will recognize that in such work great saving in cost can seldom be made except by sacrifice of desirable features, and that the permanent value of a building depends upon the knowledge, skill, and forethought used by the architect in the disposition of its parts, in the durability and fire-protected character of its construction, in the quality of its appointments and fittings; and finally, that the beauty of the design is no small consideration, but one which may fittingly be restrained within the limitations of brick construction. Such construction may be more or less elaborate, as the neighborhood, the site, and the size of the building may require.

Except in the special cases of buildings built by private gift as memorials, public schoolhouses demand no richer external treatment than can be given by properly designed brickwork with stone or terra-cotta trimmings. Ordinarily, with careful study, a satisfactory building can be produced if constructed of common brick of good quality. Variety can be given by the bondings of brickwork, by the use of various colored mortars in the brickwork of the several stories, and in the accentuation of certain features. To give variety of surface, and as a means of accentuation, different shades of red brick can be used with good results. By such simple means, schoolhouses may be constructed at a reasonable expense which will have a pleasing architectural effect, and few are now found to maintain that the architectural effect of a schoolhouse is an unimportant consideration, and that a beautiful schoolhouse does not do its part in the education of the young. Personally, I have regretted that I have ever built brick school buildings of the factory type. The percentage of cost between a school building designed with regard for architectural effect, and one of a purely utilitarian construction is not great. Under ordinary conditions, satisfactory architectural results may be obtained at an excess of cost of not more than 5 per cent. above that of the most "practical" construction. A careful reckoning of the cost of

the Brighton High School, the most elaborate school building designed by me, shows that but 8 per cent. of its cost was for architectural features. It will be generally admitted that a large building demands a greater relative cost for architectural effect than does a smaller one.

In designing a schoolhouse the architect should strive to produce not an English college building, a French chateau, or a "Romanesque" library, but a schoolhouse. The practical requirements of the problem demand in most cases symmetry of plan, and in all cases, lighting of the schoolrooms by wide and high windows. It is requisite that these windows should not have transom bars, and that either a flat roof or one of low pitch should be used. A high, well-lighted basement is also a requisite of a schoolhouse. The important rooms in the basement need ample windows, and a stud of 10 ft. is none too high for the proper installation of the heating apparatus. These requirements for the basement affect schoolhouse designing most radically.

Such being the general requirements which most influence the external expression of our schoolhouses, it will be found difficult to reconcile therewith features borrowed from the late English Gothic and the early English Renaissance.

Aside from economy in planning, which certainly leads to a balanced arrangement of rooms, and which, except in rare cases, precludes a picturesque and irregular disposition of these rooms, the key to the external expression of a schoolhouse is the size, and distribution, and form of windows which experience has shown to be best adapted for the needs of a schoolroom. This consideration of window treatment alone leads the architect who appreciates the economic and practical requirements of the problem to abandon picturesque treatments in a schoolhouse design, and to adopt those suggested by the brick architecture of the Italian Renaissance and by the Georgian work of England and this country. Sufficiently varied motives for the external expression of our schoolhouse plans can be found in these styles. Such motive may be used without sacrifice of the practical requirements of the buildings, while unity in the variation in design is permitted. Ample scope is given the designer by variation in texture and color of brickwork; by variety in detail, division, and accentuation of surface; in the treatment of roof, and in the mass and the proportion of the structure. By these means almost infinite opportunities for the expression of individual taste and skill are offered. Careful study in the application of these styles to schoolhouse construction will certainly tend to the greater refinement and perfection of the architectural expression of what is now a well-defined and generally satisfactory type of American building.

The architect to whom the designing of a schoolhouse is entrusted should accept the limitations imposed by the practical conditions of the problem. He should not seek to be "original," or to gain the semblance of a structure, however beautiful in its own time and for its own needs, which does not meet the requirements of an American schoolhouse. He may well be content to express in fitting architectural form the already well-developed schoolhouse plan. He will find profit by the study of the Cambridge High School. This building was, in my opinion, the first American schoolhouse which was designed in a truly artistic spirit; for here is found, with proper accentuation, good proportion, and refined detail, no sacrifice of the practical requirements which fitted the structure to its purpose.

THE recent earthquake in San Francisco, while proving very destructive to many buildings, offered another evidence of the strength of the modern steel structure. It is reported that the nineteen-story Claus Spreckles building, although swayed like a tree in the storm, was not injured in the least. The damage to buildings of ordinary construction was very considerable, while some, presumably of the older and weaker buildings, made an utter collapse.

The cyclone in St. Louis also gave pretty substantial evidence of the stability of this form of construction; for with all the destruction in that instance to wooden and other structures, the skeleton iron and steel buildings suffered little damage.—*Boston Herald.*

Strength of Brick Masonry.

(*Concluded.*)

BY IRA O. BAKER.

M. Am. Soc. C. E., Professor of Civil Engineering, University of Illinois, Champaign.

Effect of Different Mortars. The effect of the different kinds of mortar is shown in Table I. The results in this table are averages for different kinds of brick, various heights of piers, etc., and hence should be used only as showing the relative strength of different mortars.

TABLE I.

CRUSHING STRENGTH OF BRICK MASONRY.

Ref. No.	Kinds of Mortar.	No. of Tests.	Crushing strength of the masonry in lbs. per sq. in.	Strength of the masonry in terms of that of the	
				Brick.	Mortar.
1	1 lime, 3 sand	21	1,551	0.10	12.5
2	1 Rosendale, 2 sand	36	1,825	0.13	11.3
3	1 Portland, 2 sand	8	2,540	0.16	4.7
4	Neat Portland	1	2,315	0.15	0.7
5	1 Rosendale, 2 lime mortar	1	1,646	0.12	9.0
6	1 Portland, 2 lime mortar	1	1,411	0.10	7.3

Note that the substitution of a 1 to 2 Rosendale natural cement for the lime mortar added 18 per cent. to the strength of the masonry, and that the substitution of a 1 to 2 Portland cement mortar added 66 per cent. There are so few observations with the last three mortars that it is unwise to attempt any generalizations as to these mortars.

The last two columns of Table I. give interesting data as to the strength of the masonry in terms of that of the brick and also of the mortar. The ratio between the strength of the masonry and that of the brick will depend upon the manner of testing the latter. The brick under consideration were ground to a plane and tested on their broad side between steel pressing surfaces. In connection with the last two columns of Table I., see Table III. following. According to that table, brick masonry with mortar composed of 1 part lime and 2 sand has 44 per cent. of the strength of the brick; and with 1 part Portland cement and 2 parts sand the strength of the masonry is 63 per cent. of that of the brick. Nothing is known as to the strength of the mortar in Table III.

In one particular the data of Table I. are disappointing. Evidently the mortar in the second and third lines was abnormally weak. Three six-inch cubes of each mortar were tested by crushing when fourteen and one half months old. The results are given in Table II.

TABLE II.

CRUSHING STRENGTH OF MORTARS.

Ref. No.	Kinds of Mortar.	Crushing Strength lbs. of the mortar in Table I, per sq. in.	Tensile Strength of Ordinary Mortar, lbs. per sq. in.	
			Min.	Mean.
1	1 lime, 3 sand	124	25	50?
2	1 Rosendale, 2 sand	162	180	266
3	1 Portland, 2 sand	545	320	475
4	Neat Portland	3,483	500	680
4a	Neat Rosendale	521	290	385
5	1 Rosendale, 2 lime mortar	183	27	
6	1 Portland, 2 lime mortar	192	68	

The last column of the table shows the minimum and mean tensile strength of ordinary mortar. It is known that the crushing strength of cement mortar is eight to ten times as great as the tensile strength. This shows that the 1 to 2 Rosendale and the 1 to 2 Portland mortars were astonishingly poor. The crushing strength of the 1 to 2 Rosendale mortars at fourteen and one half months was less than the minimum tensile strength of natural cement mortar at one year; and the crushing strength of the 1 to 2 Portland mortar was only 1.7 times as great as the minimum tensile strength of average 1 to 2 Portland cement mortar. In a letter to the writer of this, the officer in charge of the Watertown Arsenal said: "The cement was purchased in the market, and the maker's name is not known. The mortar was mixed by an ordinary mason, and was not tested in tension."

It is very unfortunate that the cement mortar was so poor. Mortar acts as a cushion to distribute the load of compression, and consequently the nearer the physical properties of the mortar approach those of the brick the more strength will be developed in the pier. The crushing strength of 1 to 2 Rosendale cement mortar should have been, say, ten times as much as it was, in which case the crushing strength of the masonry would certainly have been increased. Let us see if we can compute what it would have been. The third mortar in Tables I. and II. is four and one third times stronger than the first, and the third masonry is roughly two thirds stronger; therefore, assuming the crushing strength of the 1 to 2 Rosendale mortar to have been 1,500 lbs. per square inch (about eight times the minimum tensile strength in Table II), and applying the above ratio, the masonry with 1 to 2 Rosendale mortar would have had a strength of about 4,000 lbs. per square inch. Reasoning similarly, the masonry with 1 to 2 Portland cement would have stood something like 5,000 lbs. per square inch.

Effect of Size of Cross Section. The experiments show conclusively that the strength decreases as the area of the cross section increases. Twelve-inch piers are about 20 per cent. weaker than eight-inch piers, and sixteen-inch are about the same amount weaker than twelve-inch ones, — all under like conditions. There are comparatively few exceptions to these conclusions. The greater strength of the smaller pier is doubtless due to the better bonding.

Effect of Height of Pier. Naturally the strength of the pier decreased as the height increased. Averaging all the grades of brick together, and representing the height in feet by H and the diameter in feet by D, the crushing strength of piers may be represented by the following formulas: —

With 1 to 3 lime mortar,
the crushing strength in pounds per square inch $= 2{,}330 - 102\frac{H}{D}$. (1)
With 1 to 2 Rosendale mortar.
the crushing strength in pounds per square inch $= 2{,}520 - 104\frac{H}{D}$. (2)
With 1 to 2 Portland mortar.
the crushing strength in pounds per square inch $= 3{,}350 - 132\frac{H}{D}$. (3)

Hollow vs. Solid Piers. Seven piers 12 ins. square, with a hollow core 4 ins. square running from top to bottom, and four piers 16 ins. square, with a hollow core 8 ins. square, were tested. Nothing significant is shown by these experiments, the crushing strength per square inch of net area agreeing surprisingly with the values for solid piers of the same external dimensions.

Effect of Profile of Pier. One of the most interesting tests of the whole series is that of an 8 by 16 in. pier with a 16 by 16 in. base. The smaller section was connected to the larger by four courses, each of which projected on two sides an inch beyond the course next above it. The pier was 50 ins. high, the small section being 25 ins. high. The pier consisted of thirty courses of "face" brick in lime mortar, and was tested when two and one half months old. The average thickness of the joints was three sixteenths of an inch. This pier failed in the lower and larger portion under a stress of 601 lbs. per square inch, the upper and smaller portion showing no signs of failure under 1,233 lbs. per square inch. The problem is: Why did the pier fail in the larger portion under less than half the stress the smaller portion bore without any signs of failure?

Fig. 1, made from the pier now in the Masonry Laboratory of the University of Illinois, shows the cracks developed in the base section during the test. The only cracks are those shown in the illustration and similar ones immediately opposite in the back face. The cracks are approximately in the plane of side of the top section. Apparently the failure is due to the compression of that portion of the bottom section directly under the top section, thereby causing the compressed portion to shear off from the uncompressed part of the base section. This fact is very surprising and is important in designing footing courses. Probably if the base section had been thinner the pier would have been stronger, and possibly failure would have taken place in the smaller section.

A pier having an 8 by 8 in. top section of twenty courses, and a 15 by 16 in. bottom section of eight courses, with four contracting courses connecting the larger and smaller portions, laid in neat Portland cement mortar and tested when two and a half months old, failed in the smaller portion under 3,540 lbs. per square inch, the stress on the base section being 833 lbs. per square inch. In this case the difference between the upper and lower sections was too great to secure the effect discussed in the preceding paragraph.



FIG. 1.

Effect of Age. The experiments give little or no information as to the effect of age upon the strength of masonry. Four twelve-inch piers laid in 1 to 2 Rosendale cement mortar, tested when twenty-one months old, are comparable with four tested when six and a half years old. The first four gave an average strength of about 2,100 lbs. per square inch, while the second four gave about 2,000 lbs. per square inch. Notice that the younger masonry is the stronger. This difference is greater than can be accounted for by the *probable* error of the experiments; nevertheless, it may be due to error. However, it may be due to unsound cement.

Apparently masonry laid in lime mortar was the same strength at two and a half, fourteen, and twenty-four months of age. This condition is based on only two experiments of each age, and is therefore liable to considerable error. It is interesting, however, as showing the rapidity with which lime mortar gains its strength.

Effect of Various Elements. One twelve-inch pier with joints broken every sixth course, and one twelve-inch pier with the brick laid on edge, were tested, but the result is without special significance. It is impossible to draw any safe conclusions from a single test. The difference between the results for the two piers above and those for piers built in the ordinary way is not greater than the error of the experiments.

Six piers were tested with blue stone cap and base, but the stone did not materially affect the strength of the brick masonry, as might have been foretold.

A pier of face brick 12 ins. square and 6 ft. high, laid up hollow without any mortar, had a strength of 525 lbs. per square inch — about one third of a similar pier with mortar.

VALUES ALLOWED IN PRACTISE.

According to the building regulations of Berlin, the safe load for brick masonry is less than one tenth of the results in Table III.

TABLE III.

ULTIMATE STRENGTH OF BERLIN BRICK MASONRY.*

Ref. No.	Kind of Brick.	Average Crushing Strength of Brick, lbs. per sq. in.	Ultimate Strength, in lbs. per sq. in., of Brick Masonry with Mortar Composed of			
			1 Lime 2 Sand	½ Lime 1 Cement 1½ Sand	1 Cement 6 Sand	1 Cement 3 Sand
1	Clinker Stock . .	5,390	2,370	2,590	2,960	3,410
2	Selected Stock .	3,669	1,620	1,760	2,020	2,320
3	Ordinary Stock .	2,930	1,290	1,390	1,610	1,850
4	Perforated . . .	2,759	1,210	1,320	1,520	1,710
5	Porous	2,617	1,150	1,250	1,440	1,650
6	Porous Perforated.	1,195	530	570	650	750

Table III. purports to give the ultimate strength of the masonry, and claims to be derived from experiments. The internal evidence is that it was not derived directly from experiment. If the strength of the brick in any line of Table III. be represented by 1, that of the corresponding masonry in the several columns will be represented by 44, 48, 55, and 63 per cent. respectively, which shows that the results were computed and not derived directly from experiment. However, these per cents. are interesting as showing the relation between the masonry and the strength of the brick, and also as showing the relative strength of the several grades of masonry. These per cents. correspond to the numbers in the next to the last column of Table I. It is not stated how the brick in Table III. were tested, but it is evident that they are very much weaker than those in Table I. (It will be remembered that the latter had a strength of from 11,000 to 18,000 lbs. per square inch when ground flat and tested on the broad side.) Although the brick of Table III. are much the weaker, the masonry is much the stronger. In Table III. the term "cement" almost certainly means Portland cement.

The pressure at the base of a brick shot-tower in Baltimore, 246 ft. high, is estimated at 6½ tons per square foot (about 90 lbs. per square inch). The pressure at the base of a brick chimney at Glasgow, Scot., 468 ft. high, is estimated at 9 tons per square foot (about 130 lbs. per square inch); and in heavy gales this is increased to 15 tons per square foot (210 lbs. per square inch) on the leeward side. The leading Chicago architects allow 10 tons per square foot (140 lbs. per square inch) on the best brickwork laid in 1 to 2 natural cement mortar, and 5 tons for ordinary brickwork in lime mortar. Ordinary brick piers 18 by 24 ins. by 10 ft. have been known to bear 40 tons per square foot (560 lbs. per square inch) for several days without any sign of failure.

Tables I. and III. appear to show that the above practise is very conservative with regard to the pressure allowed on brick masonry. According to Table I., the ultimate strength of ordinary brick masonry with lime mortar is 112 tons per square foot (1,551 lbs. per square inch); and with *good* 1 to 2 natural cement is certainly at least 130 tons per square foot (1,825 lbs. per square inch), and probably twice this amount; and with *good* 1 to 2 Portland cement is certainly 180 tons per square foot (2,540 lbs. per square inch), and possibly twice this amount.

The nominal pressure to be permitted upon brick masonry depends upon the kind of material employed: the degree of care with which it is executed: whether it is for a temporary or permanent structure, an important or unimportant structure: and, it may be added, the care with which the nominal maximum load is estimated. Hence it is illogical to attempt to use a constant factor of safety. The designer must use his judgment and his knowledge of the attendant conditions of the problem in hand.

* From "Abstracts of the Institute of Civil Engineers" (London). Vol. 79, p. 376.

On the Saline Efflorescence of Bricks.

THE CAUSES LEADING TO IT, AND THE PRACTICAL MEANS OF AVOIDING THE SAME.— *Continued.*

BY OSCAR GERLACH (PH. D., BERLIN).

BURNING.

THE efflorescences produced by the sulphates in the green brick or during the water-smoking are always visible on the surface of the burnt product, either in the form of whitewash or in that of minute warty, crystalline kernels. On the other hand, the burnt products may come from the kiln faultless in appearance and without a visible trace of coloration, and yet conceal in their interiors considerable quantities of sulphates, which, when the bricks are later wet by water, are dissolved and make their appearance at the surface. These salts arise always during the burning,— not before,— and are particularly annoying because of their usually appearing first in the finished buildings, where, through the effects of rain and frost, they gradually are drawn to the surface.

Hitherto the opinion has been erroneously entertained that, in *burning*, only the sulphurous acid gas due to combustion participates in the formation of whitewashing sulphates, whereas the undisintegrated iron pyrites still remaining in the clay was left entirely unnoticed. Now Dr. Hans Guenther, of Carlsruhe, has recently shown by a series of instructive experiments that also the iron pyrites *in the clay* participates in the formation of whitewashing sulphates during the burning: and this is readily intelligible when we reflect that the sulphurous acid gas, produced by the combustion, must act mainly on the surface of the bricks and can only gradually penetrate into their interior, whereas the combustion of the finely distributed iron pyrites in the brick itself brings the generated sulphurous acid gas into immediate contact with the finely distributed carbonates of the clay, and so renders possible a perfect absorption of the acid by the carbonates.

The formation of whitewashing sulphates during burning takes place as follows:—

A part of the sulphur in the iron pyrites (FeS_2) is very loosely combined with the iron, and oxidation of this part begins at approximately 650 degs. Fahr., whereas the other part burns only at red heat. The products of the disintegration are oxide of iron (Fe_2O_3) and sulphurous acid gas (SO_2). Expressed in chemical formulæ, we have:—

$$\text{I.}\quad FeS_2 + 2O = FeS + SO_2$$
$$\text{II.}\quad 2FeS + 7O = Fe_2O_3 + 2SO_2.$$

The sulphurous acid gas SO_2, when heated in contact with solid porous bodies, is oxidized by the superfluous oxygen of the air of combustion to sulphuric acid, or converts existing oxides into sulphuric salts. It was for a long time erroneously believed that the presence of water or of water vapor was necessary to the formation of sulphates; but as early as 1856 Plattner in his book, *Der metallurgische Röstprocess*, demonstrated experimentally that sulphurous acid gas in combination with the oxygen of the air and in contact with minute particles, or in contact with porous solid bodies, oxidizes to sulphuric acid, and that the water vapor in the air was not of consequence for the formation of this acid. If the minute particles or porous bodies are or contain oxides, these oxides are converted into whitewashing sulphuric salts. The following of Plattner's experiments is of special interest to the brickmaker. He conducted a mixture of sulphurous acid gas and atmospheric air, once wet and once dry, over some unslacked lime (CaO) in a glass tube. At red heat the lime was converted into calcium sulphate ($CaO + SO_2 + O = CaSO_4$) without a trace of sulphurous acid or sulphuric acid being noticeable at the free end of the tube. All the sulphurous acid, accordingly, was absorbed by the lime and converted by the oxygen of the air into sulphate of calcium. The same experiments were made with other oxides with the same results.

In the burning of clay products the same conditions prevail, pro-

vided the fuel contains sulphur and the clay contains carbonates of calcium, of magnesia, or of alkalies — which is to a greater or lesser extent usually the case. At red heat the carbonates, liberating their carbonic acid, are converted into their respective oxides, which, being finely distributed throughout the porous brick by the oxidizing action of the air, combine with the sulphurous acid gas to form whitewashing sulphates.

To turn these laboratory experiments to account for practical brickmaking, the experiments were made on a large scale. Different clays were burnt with different fuels, and the amount of sulphates contained in the products determined both before and after burning.

EXPERIMENT I. *Clay alone contains sulphur.*

Material. Clay containing both iron pyrites and a small quantity of carbonate of lime.

Mode of Burning. Red heat (about 1650 to 1750 degs. Fahr.). Gas furnace. Oxidizing flame. The gas employed showed only the merest traces of sulphur. A kilogram of the *unburnt* clay contained 0.584 grams $CaSO_4$, or calcium sulphate. A kilogram of *burnt* clay contained 2.874 grams of $CaSO_4$. *Result,* Since the fuel contained no sulphur, the *fivefold* increase of the amount of whitewashing sulphates in the burnt product must have been *entirely due to the presence of the iron pyrites in the clay.*

EXPERIMENT II. *Both the clay and the fuel contain sulphur.*

Material. Same clay as in Experiment I.

Mode of Burning. Red heat. Coal fuel. Oxidizing flame. Coal contained 3 to 4 per cent. FeS_2, or iron pyrites. The amount of sulphates was determined in *several* different burnt bricks. A kilogram of the burnt clay contained on an average 12.76 grams $CaSO_4$.

Result. A more than *twenty-fold* increase of the whitewashing sulphates.

EXPERIMENT III. *Fuel alone contains sulphur.*

Material. Clay free from iron pyrites, but containing much carbonate of lime.

Mode of Burning. Red heat. Fuel, coal, etc., as in Experiment II. One kilogram of the *unburnt* clay contained 0.483 grams $CaSO_4$. One kilogram of the *burnt* clay contained 16.85 grams $CaSO_4$.

Result. An almost *forty-fold* increase of whitewashing sulphates.

EXPERIMENT IV. *Clay and fuel free from iron pyrites (at least containing traces only).*

Material. Same as in Experiment III.

Mode of Burning. Gas furnace. Oxidizing flame. Red heat. One kilogram of the *unburnt* clay contained 0.483 $CaSO_4$. One kilogram of the *burnt* clay contained 0.621 $CaSO_4$.

Result. A very *slight* increase of whitewashing sulphate.

EXPERIMENT V. *Fuel free from iron pyrites. Clay containing great quantities of iron pyrites, but only traces of carbonate of lime.*

Material. Clay containing large quantities of iron pyrites, but almost free from carbonate of lime and other carbonates.

Mode of Burning. Gas. Oxidizing flame. One kilogram of the *unburnt* clay contained 0.321 grams $CaSO_4$. One kilogram of the *burnt* clay contained 0.518 grams $CaSO_4$.

Result. A *very slight* increase.

EXPERIMENT VI. *Fuel and clay both contain iron pyrites, but the clay shows only traces of carbonate of lime.*

The materials and the results were the same as in Experiment V.

CONCLUSION.— It follows from the above experiments that the whitewashing sulphates are formed in large and annoying quantities only when sulphurous acids and carbonate of lime, or other carbonates, *occur together* in chemical action. Sulphurous acid has no injurious effect on clays containing no carbonates of lime, magnesia, or alkalies. Such clays, accordingly, can be burnt with sulphurous coal without any fear of an increase of whitewashing sulphates, whilst clays containing carbonate of lime require a fuel free from sulphur.

Fire-proofing.

HOW TO BUILD FIRE-PROOF.

(Concluded.)

BY FRANCIS C. MOORE,

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SUMMARY OF IMPORTANT POINTS.

FOUNDATION.

It is hardly necessary to deal with the foundations of buildings. The question is an engineering problem which hardly requires suggestions from a fire standpoint, and I shall not deal with it here, other than to touch again upon the important point of not having wrought-iron or steel columns in the cellar or basement, where moisture and gas conditions would increase the danger of rust.

ENCLOSING WALLS.

These, as already stated, should be of brick, the lower stories laid in cement mortar, not less than 16 ins. thick at the top of the building and increasing 4 ins. in thickness for every 25 ft. in height to the bottom. This would require a 44 in. wall at the grade for a 200 ft. building. The thicknesses here recommended are for buildings not exceeding 100 ft. in depth. If they exceed this depth without curtain or cross walls, or proper piers or buttresses, the walls should be increased in thickness 4 ins. for every additional 100 ft. in length.

Brick is the best known resistant of fire. Stone yields readily to the combined effect of heat and water, and even terra-cotta or burned clay tile cannot be regarded as a perfect substitute for hard-burned brick.

Under no circumstances should the iron framework of a skeleton building be incorporated in thin enclosing walls. No wall that has not a cross section sufficient to support itself without the iron-work should be allowed, aside from the importance of having it thick enough to prevent the passage of hot air from an adjoining building.

Curtain walls for enclosing walls supported by the longitudinal members of skeleton construction are objectionable; they are liable to be buckled out by the expansion of the framework. The great trouble with modern fire-proof structures, even under the New York building law, is that while the separating fire-proof floors tend to prevent the passage of flame from one story to another, the enclosing walls are often insufficient to prevent heat from igniting the contents of an adjoining building, so that what is gained by preventing the spread of fire vertically is lost laterally.

It should be borne in mind that the thickness of walls herein recommended is not for carrying capacity as bearing walls. Thinner walls would answer for that purpose. It is intended to confine the heat generated by a fire and should be required in the compact portions of cities, where every man should be compelled to build with reference to the safety of his neighbor.

Architects and builders generally seem to have in mind only the carrying capacity of walls and to lose sight of this important fact.

As the contents of a mercantile building and its floors burn they sink to the bottom, where enormously high temperatures are reached, and it is for this reason it is recommended that walls increase in thickness as they approach the bottom, on the same principle that the walls of smelting furnaces are thicker at the bottom than at the top.

It is the generally accepted opinion that a 12 in. brick wall will prevent the passage of fire, but a much thicker wall will fail to confine the heat of a burning building, on the first floor particularly, sufficiently to prevent the ignition of combustible merchandise or other material in an adjoining building. In a fire which occurred in Boston, several years ago, combustible material was ignited

through a 3 ft. wall, which became so hot as to thus conduct the heat into the adjoining building. In an isolated location an owner might be permitted to construct his walls with reference only to their carrying capacity, but where he builds in the compact part of a city, storing combustible materials from cellar to roof, he should be required to build so that a fire in his premises will not necessarily destroy his neighbor's property. He may well observe a regulation which, in view of the fact that the buildings of his neighbors outnumber his own a thousand to one, will ensure that he shall be in that proportion the gainer by rules which secure the safety of all though imposed on himself.

I do not believe "skeleton construction" so called should be permitted for stores, warehouses, or manufactories in cities, as the walls are not thick enough to confine the heat of burning merchandise.

In some of our Western cities, Detroit, Chicago, etc., the practise is growing of using hollow tiling, bonded like ordinary brickwork, 12 ins. thick, for enclosing walls, instead of brick, the exposed steel frame being protected by terra-cotta slabs about an inch thick. Such a building would burn more quickly than an ordinary wooden-joisted building properly constructed. The Leonard Building, in Detroit, destroyed by fire Oct. 7, 1897, was an example of the great danger of this style of construction. It was ten stories high, and as fast as the columns or wall girders were warped by the heat the tiling dropped out like loose bricks, leaving the entire structure after the fire a ragged cage-work of iron with very little of the tiling on the enclosing walls and none of the floors intact. The contents were, of course, totally destroyed.

PIERS, BOND STONES, ETC.

Bond stones should not be allowed in piers, especially in the cellar or basement, or in piers vital to the building or carrying great weights. Stone yields readily and quickly to the combined effects of water and heat and, disintegrating at its edges, gradually releases the bricks above it, so as, in time, to destroy the integrity of the pier. Bond stones are employed by the mason to steady his work. A green brick pier while being laid is frequently unsteady, and a bond stone enables him to progress with his work by steadying all below it so as to receive new courses of brick. In all cases the bond should be a cast-iron plate. If the plate should be cast with holes through it about 1½ ins. in diameter, so that the mortar and cement can thoroughly incorporate the plate with the masonry above and below, it would be an improvement. Wrought iron is liable to rust and should not be used. Where bond stones are used in the outer walls of buildings they are less objectionable, but for inside piers they are so dangerous that they ought to be prohibited by law. Strangely enough, only stone for bonds used to be required by the New York building law, and such was the opposition of the stone men to the prohibition of bond stones altogether, when later it was proposed, that a compromise was reached allowing the use of cast-iron bonds as an alternative of stone bonds — an option seldom availed of by architects, builders, or owners, however, and construed generally by the public to mean that either is good enough.

STONE PILLARS.

It not infrequently happens that a building of otherwise admirable construction has its weakest point in the cellar, where a stone pillar forms the basis of support of the entire line of columns through the building. In case of fire and the application of water these stone pillars, no matter how substantial, whether single monoliths or stone blocks, will rapidly disintegrate and bring down the entire structure; and inspectors should carefully examine, especially in the cellars, for such construction. After the great Boston fire, granite piers were shoveled up and carted away like so much sand. It is quite a common practise, but a most dangerous one, to employ single stone columns, often of polished granite, to support the center of a long stone lintel carrying the wall over the ornamental entrance of a building. Such a column would surely yield to the effect of fire and water and perhaps let down the entire front. In almost any city (and New York is no exception) such faulty architecture may be observed. The writer passes every day a costly structure on Fifth Avenue whose corner is supported by a single granite monolith column of this kind. If stone columns are desired for architectural effect they should, wherever they carry heavy loads, contain a center column of cast iron of sufficient carrying capacity to support the superimposed weight.

CAST-IRON VERTICAL SUPPORTS.

The vertical supports, columns, pillars, etc., as already stated, should be of cast iron, cylindrical in form, of liberal thickness, especially in the lower stories, thoroughly tested as to sand holes, thin places, etc. Cast-iron columns should be round, and not square. In the former shape there is less likelihood of defects in casting, sand holes, etc., resulting in uniform sound thickness of the shell. The columns should be planed to smooth bearings, so that the entire system of columns, from the foundation to the roof, may be securely bolted together and form a continuous line with joints for expansion and without any inequalities of bearings. Under no circumstances should wedges or "shims"* be allowed. This most important matter is often neglected. The flanges and corbel brackets for supporting beams should be cast in one piece with the column and not depend upon rivets or bolts. Rivets, aside from the danger of shearing strains, are almost certain to rust to the point of danger. The beams should be riveted or bolted to lugs on the columns, however, as a tie between the side walls, holding the entire structure firmly and consistently together as one rigid whole and yet with play for expansion.

Col. Geo. B. Post, of New York, has devised a form of cast-iron cage construction consisting of pillars and floor beams of the Hodgkinson pattern the members of which lock into each other, without the use of bolts or rivets, forming a very rigid construction and saving the cost of mechanics for bolt and rivet work. While I have not had an opportunity to examine it, I have great faith in his judgment; my impression, from his description of it, is that it would be very rigid construction and admirably adapted to warehouses six and seven stories high. Above this height merchandise should not be stored in any kind of a building.

The factors of safety, in computing strains, should not be less than those prescribed by the standard modern authorities. Better be sure than sorry.

FIRE-PROOFING IRON MEMBERS.

All ironwork, columns and pillars, beams and girders, should be fire-proofed, *i. e.*, covered with at least 4 ins. of incombustible material, terra-cotta or brick. At the floor, and for a height of 4 ft. in mercantile buildings, a metal guard should be employed to prevent the column from being stripped by collisions with rolling trucks for moving merchandise. It ought to be unnecessary to suggest that wooden lagging should, under no circumstances, be used to cover iron, were it not for the fact that in one of the largest and most costly dry-goods stores in New York, the fire-proof covering of the iron columns, which had been seriously damaged by trucks, was being systematically removed in order to substitute wooden lagging, when the fault was, fortunately, detected by an inspector of the underwriters. 4 ins. of good brick-work is a good covering, but porous terra-cotta or even wire lath and plaster may prove effective. Where wire lath and plaster is used the column should first be wrapped with quarter-inch asbestos bound with wire. This would prove reliable and inexpensive.

It is a fact, showing how common is the neglect to cover iron with non-conducting material, that in the State Capitol, Albany, N. Y., in the library, is a large plate girder entirely exposed. This girder supports the ceiling beams, and there is enough combustible material in the oak bookcases, furniture, and flooring to wreck this portion of the building by expansion in case of their combustion. The New

* "Shims" are pieces of slate or iron inserted to secure a true vertical where the two surfaces have not been properly leveled or planed.

York Building Law was enacted in this building. The ceilings of the Assembly and Senate chambers are of heavy, hard wood, attached to the soffits of the iron beams, and they would, if ignited, probably warp and expand the beams to a dangerous point.

A notable instance, showing the necessity of protecting ironwork with incombustible material, and the danger of expansion in long lines of iron girders or beams, was that of the destruction of a fire-proof spinning mill at Burnley, Eng., recently. This mill was 210 ft. long by 120 ft. wide, six cast-iron girders of the Hodgkinson type, each 20 ft. long, spanned the 120 ft. width, being bolted to cast-iron columns, and carrying, in turn, cross girders of wrought iron. The expansion of these 120 ft. girders (they were unprotected) resulted in the disruption of the floor and the destruction of the mill. The cast-iron columns, being unprotected, collapsed under fire and water. The floors were 10 ft. 6 in. bays. As already stated, beams should not be spaced over 5 ft. on centers. Wider spacing results in weak arches, liable to be buckled out by heat or punched through by the falling of safes or of other heavy articles from upper floors.

The probability is that if the 20 ft. girders in this building had been arranged with provision for expansion, and all the ironwork had been thoroughly protected with fire-proof material, little damage would have been done. The effect, if the floors had been loaded with combustible merchandise, would have been more rapid. There was little wood to burn in the contents of the spinning mill, and yet the destruction was thorough. Such buildings with uncovered ironwork are more dangerous than those of heavy wood construction, in which the timbers are 12 ins. or more in diameter, and not more than five stories in height. A properly constructed building with protected iron, however, is, of course, superior to any other form of building. Experienced firemen are afraid to enter buildings supported by iron columns unless they are thoroughly fire-proofed, as they are liable to snap without warning under the influence of fire and water, whereas wooden posts burn slowly and give notice of collapse. They will stand a severe fire without being charred for more than 2 ins. of their surface.

BEAMS AND GIRDERS.

In mercantile buildings and factories beams, as already stated, ought not to be spaced more than 5 ft. apart, no matter what kind of arch is employed; and while many experts claim that a heavy iron I beam, thoroughly encased in fire-proof material on three sides and having only its soffit or under side exposed, would not be expanded enough by the heat of a fire to cause its collapse, it is best to take no chances, but to protect the under side with fire-proof material, which can be cheaply applied with wire lath and plaster, or by having the skew-backs of the terra-cotta floor fillings extend below the soffit or bottom flange of the beam, and made with lips for protecting the iron.

TIE-RODS.

It is a mistake, in my judgement, to dispense with tie-rods, even with the kinds of arches which employ wire cables or other metal ties. The claim is made that these act as tie-rods, but it should be remembered that they cannot be relied on during construction, when derricks for hoisting iron beams and other materials are resting on the girders. Dangerous lateral movements and twistings of the structure may be the result of want of rigidity, which can only be secured by tie-rods.

MATERIAL FOR ARCHES BETWEEN BEAMS.

It is my opinion — but there are many who entertain a different one — that the old-fashioned brick arch is the most reliable for resisting fire; that next to this in safety stands the porous terra-cotta segmental arch, with end construction, *i. e.*, the blocks or separate pieces placed end to end between the beams, instead of side by side in what is known as "side construction." This is said to be stronger than side construction. It is claimed by many experts that porous terra-cotta is a better non-conductor than brick on account of its interior air spaces. The arch should not be less than 4 ins. thick, having a rise of at least 1¼ ins. to each foot of span between the beams, and there should be a covering of good Portland cement and gravel concrete over this to ensure a waterproof floor. Cinder filling will burn — crushed slag from blast furnaces is better, but the Portland cement concrete should not be omitted for waterproofing purposes.

There are many patent floor arches for filling between I beams which have great merit when properly put in, but I doubt if any of them are equal to the two I have named, and it should always be borne in mind that when employed they should be inserted with the same care with which they are prepared for tests. This is almost equally true, however, as regards brick and burnt-clay arches, also. There is less likelihood of poor installation work, however, with brick arches or segmental arches of porous terra-cotta or burnt clay. Arches should be laid in Portland cement, not lime mortar. Under no circumstances should they be laid in freezing weather, and where concrete is used the broken stone or gravel should be carefully washed, and the cement should be of the best quality.

WATERPROOF FLOORS.

It is of great importance that the floors of all buildings should be waterproof, in order that the volume of water thrown by the fire department to extinguish a fire may be carried off without injury to merchandise on the floors below. Neglect of these precautions is criminal in view of their simplicity and inexpensiveness.

After the arches have been set between the I beams they should be covered, for at least a thickness of 1 in., with the best Portland cement concrete, carefully laid, so that all water will run to the sides of the building and be carried off by water vents or scuppers, which may be arranged with pipes through the walls, having a check-valve which would prevent the influx of cold air and yet admit of the outflow of water.

All ducts for carrying steam, gas, and other pipes and electric conduits should be protected with a metal sleeve going above the surface of the floor, and the space between and around the pipes should be filled in closely with mineral wool, asbestos, or some other expansive and fire-proof material to cut off drafts and flame.

FLOOR SURFACES.

Floor boards should be dispensed with, if possible, and asphalt or concrete employed instead. It is hardly practicable in office buildings, however, to dispense with wooden floors. Wherever used they should be so laid, especially in mercantile or manufacturing buildings, that there is no air space to supply a passage for flame and to form a harborage for rats and mice, to which these vermin can carry matches, oily waste, or other combustible material, to be ignited by steam pipes or by spontaneous combustion.

FIRE-PROOFING WOOD.

Various processes, "electric," so called, and otherwise, have been patented for fire-proofing wood. They undoubtedly increase the fire-resisting properties of wood for interior trim, window casings, etc. Whether or not they impair the durability of wood is a matter as to which I am not yet informed, and I doubt if sufficient time has elapsed for a proper test. The United States Navy has made trials of fire-proof woodwork — with what success I am not informed.

VENTILATING AND LIGHT SHAFTS, DUMB-WAITER SHAFTS, ETC.

The enclosures of all ventilating shafts, for water-closets, etc., light shafts, and dumb-waiter shafts should be constructed in the same substantial manner as freight elevator shafts. It is a mistake to use thin plaster board or plaster with dovetailed, or other metal, lath, etc. No enclosure should be relied upon less than 4 ins. in thickness, well braced with angle iron, but brick walls are best, especially in buildings over 60 ft. high. The lights should be of wire glass, set in metal framework, and ventilators should have metal louvers arranged to secure ventilation but not to increase a draft. Slats should be riveted, not soldered, to metal framework, and the metal framework should

flange well over the fire-proof material of shaft on both sides. It is possible to finish tin-covered fire-proof doors with wooden trim so as to be ornamental, with bead panel-work, etc.

WELL-HOLES.

These should be avoided if the building is to be regarded as fire-proof. The Horne Building had one 48 by 22 ft. It is almost impossible to control a fire starting in the lower floors where a well-hole opens through those above. Luxfer Prisms are now used to secure light from side windows, it is claimed, with great success.

A recent fire test of the Luxfer Prism, in Chicago (March, 1898), is stated to have been satisfactory to Fire Marshal Swenie, as showing that these prisms afford material protection from the heat of a neighboring fire in an exposing building, and that to some extent they are substitutes for iron shutters.

STAIRCASES, ELEVATORS, ETC.

These should be in hallways cut off from the rooms at each story by fire walls and doors, to prevent drafts. It is not so important, and is not so practicable, in the case of office and hotel buildings as in the case of mercantile and manufacturing buildings; but it is advisable, even in office buildings, to have the staircases, elevators, etc., in a separate hallway, the division walls of which should extend through and above the roof, and any skylights should be covered with glass not less than ¼ in. thick.

SKYLIGHTS.

It is contended by some that skylights should be of thin glass, so that they will break easily and permit the escape of smoke and gas. Smoke is ignitible, and when it accumulates in a building often spreads the fire from story to story, or blows out the walls by the explosion of its gases. But while thin skylights are contended for by many expert firemen, it should be borne in mind that nothing so facilitates the spread of fire as a draft, and it would be better to have the skylights adjusted with appliances for opening them, so that when the firemen arrive on the ground, and not before, they may be adjusted to permit the escape of smoke and allow the firemen to enter the building to see where to work to the best advantage. Under any circumstances a network of wire should be above the glass to guard it against flying embers, and another should be suspended beneath the skylights, so that when the glass cracks and breaks with the heat it will not injure the firemen below.

ROOFS.

These should be of brick or tile on all high buildings, the roof beams being of iron and, where tanks are supported, of sufficient strength to carry many times the actual probable weight of the water and the containing tank itself.

SLATE ROOFS.

Slate roofs, on very high buildings especially, on street fronts are objectionable, as, in case of fire, the slates would crack and, falling to the street, injure the firemen. A flat roof of brick tile is better than any other.

All water on roofs from rain or melting snow should be drained from the front or sides to leaders, so as to avoid drip points, from which icicles could be formed. Too little attention is paid to the great danger of injury to pedestrians from falling snow or icicles on very high buildings. This may not be a suggestion strictly germane to this article, but it is a matter so often overlooked as to warrant its being referred to in an article intended to deal more or less thoroughly with the subject of fire-proof buildings.

ELECTRIC LIGHT INSTALLATION, DYNAMO ROOM, ETC.

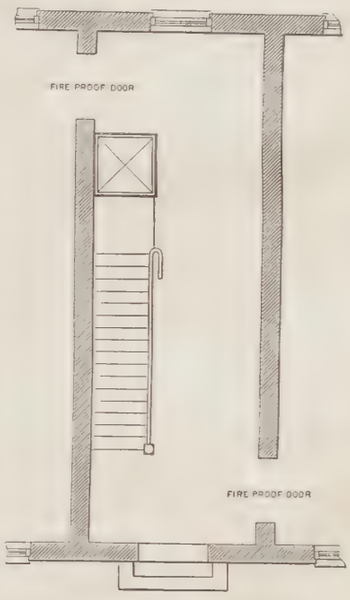
The electric light installation of a large fire-proof building is an important and complicated matter. To insure safety, reference should be had to the rules of the National Board of Fire Underwriters, which can be obtained, without charge, from the nearest local board of underwriters.

The switchboard should be of incombustible material, and no steam, water, or sprinkler pipes should pass over or near it where, in case of a bursting pipe, water could reach the switchboard and cause disaster. This is an important matter almost universally overlooked.

An admirable floor for a dynamo room is one of deck glass, ¾ in. thick, on a wooden (not iron) frame. It will insure that the attendant upon the dynamos will be, at all times, effectually insulated. Such a floor will not become soaked with oil, as would a wooden floor, and can easily be kept clean. A strip of rubber floor carpet stretched over it will prevent slipping. The Continental Insurance Company has, probably, the only floor of this kind in the country in its large fire-proof office building on Cedar Street, New York.

COMMUNICATIONS BETWEEN ADJOINING BUILDINGS.

It is sometimes necessary to have communications between adjoining buildings by doors in the fire walls, and it is not always convenient, for changing merchandise from one room to another, to have fire-proof doors closed during working hours. It is possible to have the fire-proof doors run upon trolleys on an inclined track so as to close by the force of gravity, and held open by fusible metal latches or links which would release them when melted by the rising temperature of a fire. It has occurred to me that this difficulty may also be met by erecting between two adjoining buildings a separating fire-proof hallway of brick, which can be utilized for containing staircases and elevators, and for supporting the water tanks of automatic sprinklers. The doors which open into this hallway should not be opposite each other, but at opposite ends of it, so that fire in one of the buildings passing through the door would come against a blank wall opposite. Even if the fire-proof doors to these openings should happen to be open at the time of a fire in one of the two buildings, it is improbable that it would find access to the other.



SEPARATING FIRE-STOP HALLWAY.
GROUND PLAN.

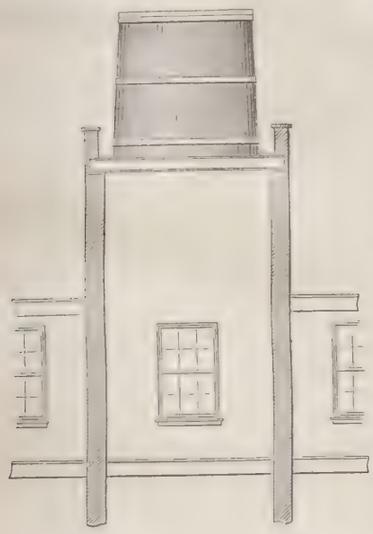
The floors should be both fire and water proof, slightly lower than those of the two separated buildings, and with water vents or "scuppers" for carrying off surplus water thrown by a fire department. Indeed, it is well to have "scuppers" on all floors of every building.

The walls of this separating hallway or vestibule should rise 4 ft. higher than the roofs of the two buildings, and, if there are window or door openings near it, its walls should project beyond the line of enclosing walls at least 1 ft. The following diagrams fully illustrate the idea.

The water tank, as already stated, should be supported on protected iron I beams, resting on the brick walls, with cast-iron templates, so that the tank cannot fall, break down the staircases and wreck the building in case of fire.

It is important always to locate tanks so that they will not be over stairways or elevators and endanger them in case the supports give way. With a fire-proof hallway of the kind recommended, containing no combustible material whatever, the tanks being supported by iron I beams resting on the brick walls, this would not be an important matter, but in all other cases water tanks should be planned so as not to endanger staircases, and the supporting iron beams should be fire-proofed, that is, covered with fire-proof material.

It ought to be unnecessary to state that there should be no combustible material whatever in this separating hallway, and that the staircase, elevators, etc., should be of metal and fire-proof.



SEPARATING FIRE-STOP HALLWAY — ELEVATION OF UPPER STORY AND ROOF WITH WATER TANK.

SEPARATION OF WOODEN BUILDINGS.

Indeed, such a hallway as this could be relied upon to separate wooden buildings. It should, however, for that purpose, be at least 10 ft. higher than the peak of their roofs and should extend 4 ft. beyond their front and rear lines. It is probable that the extensive frame dairy buildings of ex-Vice-President Morton at Ellerslie, which burned several years ago, might have been saved by this simple precaution.

OUTSIDE STAIRCASES.

Where it is not necessary to transfer merchandise from one building to another and only requisite to have a passageway for employees, this may be arranged by an iron balcony, like a fire escape, cutting down the window on each side of the separating wall for a door, so that communication can be had by the balcony. The openings should have fire-proof doors. This would be practically safe. It might, with iron ladders, be utilized as a fire escape, and so prove of great advantage to firemen in fighting a fire, who could hold a hose nozzle at the different windows with perfect safety to the last moment. It is practicable, indeed, to have iron stairways with roofed balconies entirely outside of storage stores so that the floors do not communicate. There is a number of these in Philadelphia.

FIRE-PROOF DOORS AND SHUTTERS.

These should not be of iron, but of wood covered with tin. Solid iron shutters or doors are not reliable. Iron doors yield readily to flame, resulting sometimes in their warping open when exposed to fire in an adjoining building, exposing the one they are intended to protect to the full effect of the flames.

Where window openings are protected by iron shutters on rear courts they are almost certain to be opened by a fire in an exposing building, and cannot be relied upon. The tin-covered wood shutters are alone reliable. There is no recorded instance in which a solid iron door, exposed to the full effect of fire in an adjoining building, has protected the opening, whereas there is, on the other hand, no recorded instance in which the "Underwriters'" door has failed to serve its purpose — two important facts which are significant and ought to settle the question.

The "Underwriters'" door is constructed of ordinary white pine lumber, free from knots, of double or treble thickness, according to width of opening, the boards being nailed diagonally and covered with the best quality of tin, with lap-welded joints.

It ought to be unnecessary to state that on the exposed side of a building, not only the shutter, but the window-frame, sash, etc., should be of metal or covered with metal — riveted, not soldered. Where it is not possible to use a fire-proof shutter for want of room, wire glass in a metal frame will be found a desirable substitute. It will probably hold a fire until the fire department can cope with it.

It is not generally understood or known that fire will travel from one story to others above by way of the windows in the outer or enclosing walls. Especially where a building has an enclosed court it will sometimes reach upper stories in this way, even when the floors themselves are thoroughly cut off, the court acting as a chimney. This happened several years ago in the Temple Court Building, a fire-proof structure in New York. The woodwork on several floors was ignited by the lapping of fire through the windows from the lower stories and serious damage resulted. A recent instance was the Livingston Fire-proof Building in New York, in January, 1898. All windows on exposed sides should be protected with fire-resisting shutters.

It may be well to suggest for the benefit of those who are not familiar with city fires that, as heat naturally ascends, the exposure of a low building is often much greater to a neighbor higher than itself than to a building of its own height, so that a tall, fire-proof structure, surrounded by smaller buildings, should be provided with fire shutters to all openings. These are not necessary where the exposing buildings are occupied for offices, and are themselves fire-proof, as the amount of heat which escapes from the windows of a burning building, so long as its enclosing walls remain intact, is seldom sufficient to ignite a fire-proof building or its contents. The moment of greatest danger is when a burning building collapses and the intense heat caused by its enormous bed of coals exerts its full effect upon surrounding structures. In a recent fire in New York (Feb. 11, 1898), three fire-proof office buildings were more or less damaged with their contents, although many feet away from the burning building.

It is to be hoped that some inventive genius will devise a plan for simultaneously opening or closing the shutters on any or all stories of high buildings by manipulation from the ground floor. They are usually left open at night, always in the daytime, and might thus be closed in case of a dangerous fire in the vicinity. In some cases they are fastened open.

COMPARATIVE TESTS OF FIRE-PROOF MATERIAL.

Tests of fire-proof material, iron beams, pillars, floor arches, etc., to be of any value must be conducted under circumstances which insure uniform conditions. Otherwise comparisons are unreliable. It is quite customary to refer to results of fires in different buildings, having differing forms of construction, as supporting theories of relative merit; but ordinary conflagrations cannot be relied upon, for the reason that in two buildings, side by side, the conditions may be widely different. Eddies and currents of air, changes of prevailing wind, etc., may secure exemption from damage. It happened in the large conflagrations of Chicago, Troy, Boston, etc., that the most phenomenal escapes were observed. In some instances frame buildings, surrounded by brick structures which were totally destroyed, escaped with no further damage than the blistering of paint.

Even where tests are carefully arranged, especially weight tests, obvious precautions are sometimes overlooked. It will be observed, for instance, where bricks are piled on a surface of floor arch and iron beams to secure a certain weight per square foot, the pile of bricks may be so disposed as to have a bearing on both of the iron beams and the full weight may not come upon the fire-proof arch between them. The lateral bond of a pile of bricks a few courses higher than the floor to be tested may have all the effect of a relieving arch and materially reduce the strains. In furnaces constructed to secure high temperatures, drafts and currents of air should be provided for with great care and under the direction of the most competent and intelligent experts.

In conclusion it may be well to state, in view of the general misapprehension which prevails with regard to the interest of the fire underwriter in the improvement of construction, that it makes no difference to him whether a building be fire-proof or not; his rate of premium and the amount which he insures are both based upon the characteristics of each building insured. He would make just as much money on $100 of premium secured at a rate of 5 per cent for $2,000 insurance on a wooden planing mill as on $100 of premium secured on $100,000 insurance on a fire-proof building the rate of which is $1 per $1,000.

The Masons' Department.

THE CONTRACTOR AND THE REFEREE.

NEARLY all the standard contract forms which are used in formulating agreements respecting building operations contain a clause providing for settlements of differences between the owner or the architect and the builder, and although a very large share of power is of necessity conferred upon the architect, and the owner and the builder nominally agree to leave nearly everything to his decision, there is always reserved an appeal to supposedly disinterested referees. In theory a referendum of this sort is a perfectly fair way of settling differences. In practise, however, it fails very often because of the unwillingness of one party or the other to accept the results of the reference, and law suits follow with all their attendant evils. A law suit, at the very best, is an unsatisfactory way of settling differences. If the parties can only agree to finally agree, will only allow disinterested advice to prevail, and will then steadfastly refuse to reopen the question, a recourse to the courts need very seldom be resorted to. There is an opportunity for the master builders' associations throughout the country to accomplish a great deal, and win for themselves a large measure of prestige if they would use their already considerable influence to in some way enforce the value of a referendum, and to put themselves on record in such unmistakable manner that the decisions of the properly constituted board of reference would have the weight which theoretically the existing contract forms give to it. Some of the master builders' associations have already taken steps looking towards something of this sort. One of the largest of these parties recently had under serious consideration a by-law which provided for the appointment of a permanent board of arbitration, to which all questions which should arise, either between members or with members and some outsider, should be submitted for judgment, the association simply offering its good services, and standing ready to arbitrate between interested parties. Unfortunately, the builders who are honestly desirous of fair treatment, even if they are losers thereby, are always in the minority, while the number who feel they are free to do just as they please, who prefer independence of society control, and who claim the liberty to take advantage of every opportunity in their favor, rightly or wrongly, are always on the alert to head off anything which looks like a restriction of what they assume to be their rights. As a matter of fact, however, builders of this sort are the very ones who would profit most by a referendum. So long as the struggle for existence shall continue there will be more workers than there is work, and the minor builders, the ones with limited means, will be those who will have to take chances and are likely to be imposed upon by unscrupulous owners or by fraudulent subcontractors; and if they could lay all their troubles before a properly constituted board, with the assurance that they would be fairly treated, and would then have the courage to stand behind the award instead of rushing into the courts if the judgment goes against them, there is no doubt they would in the long run be vastly the gainers thereby. Indeed, the principle can and ought to be carried even farther. The master builders' associations are, as a rule, self-respecting, influential bodies, which can and should provide opportunities not only for peaceful arbitration of differences, but can go farther and make such arbitration obligatory upon their members both in the submission of differences and the acquiescence in the award, with the penalty of dismission from the body if the award is not accepted.

TESTS OF QUICK-SETTING CEMENT.

BY PROF. CECIL B. SMITH.

BECAUSE of the abuse which our quick-setting cements (the natural set of which may be in ten or twenty minutes) receive at the hand of careless or ignorant users by frequent retempering in order to use large batches of mortar extending over a period of several hours, the following tests were made: —

The proportionate reduction of strength would probably hold true for mortars as well as neat tests.

In the tests a large batch of mortar was mixed up and briquettes were molded from it. At the end of one hour the remaining mass had become appreciably stiffened and was retempered by adding sufficient water and by vigorous working. The same process was gone through each hour, but very soon the activity of the cement was so greatly killed that the setting would not take place for many hours, and very little extra mixing was required.

The "Quebec Natural," corresponding to such United States cements as "Cumberland," "Round Top," etc., has an incipient set of about 30 min. and a full set of 2 to 3 degs. The "Peacock Portland" is a sound, well-burnt, but coarse English cement, having an incipient set of about 20 min. and a full set of 1 to 2 degs.

	Quebec Natural.				Peacock Portland.			
	Time of Set.	Neat Tensile Strength per square inch.			Time of Set.	Neat Tensile Strength per square inch.		
		1 wk.	1 mo.	10 mos.		1 wk.	1 mo.	2 mos.
Original test . .	3 hrs.	157 lbs.	278 lbs.	520 lbs.	2 hours.	407 lbs.	515 lbs	596 lbs.
1st retempering	4 ,,	123 ,,	210 ,,	485 ,,	5 ,,	202 ,,	341 ,,	425 ,,
2d ,,	4 ,,	80 ,,	163 ,,	435 ,,	4 ,,	184 ,,	290 ,,	382 ,,
3d ,,	19 ,,	73 ,,	153 ,,	405 ,,	very slow.	185 ,,	365 ,,	388 ,,
4th ,,	19 ,,	52 ,,	157 ,,	380 ,,	,,	.....	165 ,,	398 ,,
5th ,,	19 ,,	72 ,,	172 ,,	295 ,,	,,	213 ,,	347 ,,	383 ,,
6th ,,	21 ,,	.....	173 ,,	290 ,,	,,	180 ,,	310 ,,	402 ,,
7th ,,	.....	. ...	.....	265 ,,	,,	220 ,,	332 ,,	367 ,,

This table seems to point out two or three things rather clearly: —

1. That the first and second retempering do all the injury, the subsequent ones being merely the reworking of a mass which has not set.

2. That the strength of retempered cements is roughly one half of those not thus treated.

3. That time does not "heal all wounds," as the strength at ten months with the natural cement, and two months with the Portland, has not recovered to any very appreciable extent. This last deduction does not agree with the student thesis paper on the subject published about two years ago in the *Engineering News*, which claimed a recovery of strength in course of, say, six months.

I trust that such a memorandum as this will bring out some discussion on the matter from men whose experiences on the subject will be of value to the profession.

WALLING UP.

THE present manner of laying brick in dead walls gives one the impression that the quantity of bricks laid is of far more importance than the quality of the work done. The only way to obtain good solid brick walling is to either flush the joints solid with mortar every course or make a shove joint; the former method takes too much time and material, and the latter is very rarely done except in very heavy buildings. The custom generally adopted is to spread the mortar on the bricks (a portion only of which gets in the joints) and lay the bricks on top, each succeeding course being bedded in mortar; but the longitudinal and cross joints are only partially filled, the butting joint of the brick receiving a little dab of mortar gathered on the point of the trowel by cleaning the surplus mortar from the outside joint. Grouting with cement mortar every two courses in height might be adopted for basements and first stories of buildings when great strength is required. Full headers for face bricks are better than clippings and should be specified for all heavy buildings. The face bricks are often built up fifteen or twenty courses high before the backing up is done, a custom that should not be permitted, as it leaves the wall subject to many defects, as it cannot be well bonded or tied together sufficiently strong to be able to resist unequal strains successfully. For good strong work the mortar joints should never exceed five sixteenths of an inch in thickness.— *Canadian Architect.*

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.— In spite of all the anxiety and uneasiness occasioned by our present foreign troubles, the New York building record is as follows: —

Total number of new buildings, January 1 to April 1, 715 as compared with 908 during the corresponding time in 1897.

Total cost of these buildings, $17,454,325. Cost of the 908 buildings during 1897, $19,342,550.

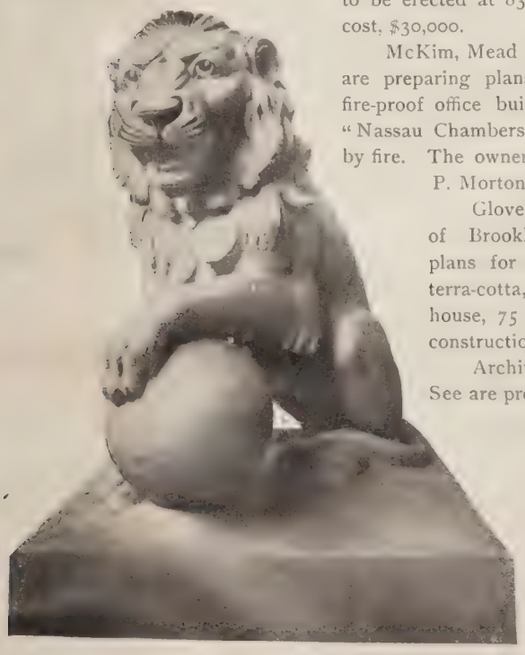
No very large or important buildings have been reported during the past month, but the general condition of work is good. Too much praise cannot be bestowed upon the new Washington Life Building, C. L. W. Eidlitz, architect. It is now nearing completion, and more than lives up to the promises conveyed in the drawings. The stone is of a beautiful soft color, the carvings are unusually well disposed, the fenestration is excellent, and it is altogether a success and one of our best office buildings. It is not on a prominent enough corner to do it full justice, however.

Among items of new work might be mentioned: Plans have been prepared by Henry M. Congdon, architect, for a new edifice for St. Mark's Protestant Episcopal Church, Brooklyn, to be erected on the Eastern Parkway near Nostrand Avenue; cost, $50,000.

A competition is now being held for designs for the new Franklin Bank. The only competing architects are Geo. B. Post, R. H. Robertson, and Lamb & Rich.

Plans have been filed by Clinton & Russell for the new eleven-story Cheseborough building. The materials will be brick and stone; cost, $430,000. The work of demolishing the old buildings upon the site has been commenced.

Quinby & Broome, architects, are preparing plans for a five-story red brick and white terra-cotta apartment and studio building to be erected at 83 Washington Place; cost, $30,000.



DETAIL, COMMERCIAL CABLE BUILDING, NEW YORK CITY.

The figure is 5 ft. 6 ins. high, located on the building at an altitude of 240 ft. from sidewalk. Executed in terra-cotta by the Excelsior Terra-Cotta Company. Harding & Gooch, Architects.

McKim, Mead & White, architects, are preparing plans for a twelve-story fire-proof office building to replace the "Nassau Chambers" recently destroyed by fire. The owner is ex-Governor Levi P. Morton.

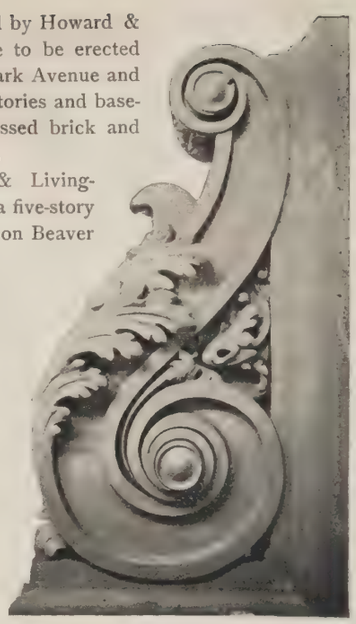
Glover & Carrel, architects, of Brooklyn, are preparing plans for a seven-story brick, terra-cotta, and stone apartment house, 75 by 80 ft., fire-proof construction; cost, $80,000.

Architects Cady, Berg & See are preparing plans for the new buildings to be erected on West 15th and 16th Streets for the New York Hospital.

Work will be commenced at once upon the new building for the University Settlement Society. The cost will be about $90,000. Stokes & Howells, architects.

Plans are being prepared by Howard & Cauldwell for a new residence to be erected on the northwest corner of Park Avenue and 58th Street. It will be four stories and basement, 28 by 100 ft., with pressed brick and limestone front; cost, $50,000.

Architects Trowbridge & Livingstone are preparing plans for a five-story office building to be erected on Beaver Street for the American Cotton Oil Company. It will be a pressed brick and stone fire-proof structure; cost, $95,000.



CONSOLES TO DORMERS, COMMERCIAL CABLE BUILDING, NEW YORK CITY.

Executed in white terra-cotta by the Excelsior Terra-Cotta Company. Harding & Gooch, Architects.

CHICAGO.— The possibility of a war with Spain has had a noticeable effect on building projects. Capital has been inclined to hold back plans for new buildings until the uncertainty be ended. Aside from this factor in the situation, however, building operations are not as brisk as those interested would like to see them. Many architects have been reaching out into new territory for their business and they are hoping that their services will be needed more urgently here in Chicago next year than they seem to be this.

Architects and contractors in general seem to be in sympathy with the new State license law. More than seven hundred architects have paid in their twenty-five dollars each, and more than five hundred of these are in Chicago alone. Any shyster architect who could swear that he was practising when the law was passed had to be granted a license. But the commission has the power to prevent unworthy acquisitions to the profession in future, and the Architects' Business Association has taken up the matter in a definite way to assist the Commission or Board of Examiners and to prosecute violation of the law, which, while it allows to con-



TERRA-COTTA DETAIL, GRAMMAR SCHOOL NO. 7, BALTIMORE, MD.

Executed by the Conkling, Armstrong Terra-Cotta Company. Wyatt & Nolting, Architects.

tractors certain independent privileges in designing their own buildings, will not allow any one to call himself an architect or to give out plans for others to bid on unless he holds a license. The revision of the building ordinances just made by the Chicago Council forbids the granting of permits on plans for any building larger than two stories, and 1,200 sq. ft. in area, unless bearing the stamp of a licensed architect.

It is of interest to note that in the revised building ordinances referred to the Chicago aldermen have juggled again with height limit of buildings. A year or so ago the limit was reduced to 155 ft., now it stands at 130 ft., or practically ten stories as the limit of height for fire-proof buildings.

This, in the opinion of prominent architects, will discourage capital from investing in the best class of buildings. The aldermen who brought about this result represent the same public opinion which resents concentration of business and is fighting the department stores.

The annual architectural exhibition is the event at the Art Institute at the present writing. The showing was a large one, even though the quality was not uniformly the highest. The exhibits sent by Eastern architects and by the schools were good, but it seems that the most prominent architects of Chicago do not take as active part as they might. It must be that we need an Art League.

One of the interesting features of the exhibition was the work of the several groups into which the Architectural Club was divided last fall. Its particular *projet* was selected by each group, and the several drawings constituting a design (in one case a scheme for an elevated railway station) were the joint work of those in the group under the direction of their leader or "patron," himself a member of the club.

One noticeable feature of the exhibition was Dwight Perkins's design for one of the Omaha Exposition buildings, accompanied by



TERRA-COTTA STRING-COURSE, THE LENOX, BUFFALO, N. Y.
Executed by the Northwestern Terra-Cotta Company.
Loverin & Whelan, Architects.

models of the groups of statuary designed for the building by R. W. Bock.

In conjunction with the architectural exhibition there was held the first annual exhibition of the Arts and Crafts Society, an organization made up of artists, architects, people interested in social settlements, and others who are trying to raise the standard of artistic excellence in the arts and crafts. The exhibit, which included products in wood, metal, and fabric, from jewelry to furniture, was surprisingly good both in quantity and quality.

PHILADELPHIA.—The John Stewardson Memorial Scholarship has become the goal of the young architectural draughtsman's hopes here, even as its older fellows in Boston and New York have long been in those cities. It is now six years since the University of Pennsylvania Traveling Scholarship in Architecture was established, and though never funded, it has sent a student abroad for four consecutive years. The sudden death of John Stewardson created the desire among his professional coworkers, admirers, and followers for some tangible evidence of their appreciation of the high place he had reached, and of the good he had done towards the advancement



RESIDENCE, BEACON STREET, BOSTON.
H. H. Richardson, Architect.

of architecture. This culminated in their raising a fund sufficient to insure for all time the continuance of the yearly scholarship with which his name was then coupled.

The prize has just been competed for by ten men, the program of competition proving of unusual interest. One has become so imbued with the understanding that scholarship competitions consist of designs for crematories, opera houses, custom houses, imperial villas, etc., of the most strictly *beaux arts* type that to break away at one step to "A Farm Steading," as was done this year, seemed quite to upset all axioms relating to this class of competitive work. The jury, Messrs. Sturgis and Andrews, having been taken, previous to the award, through Delaware County, where the farm was supposed to exist, had ample opportunity to grasp the nature of the problem, and were enthusiastic in their praise of the schemes submitted. The successful man is William C. Hays; first mention, Arthur H. Brockie; second mention, John Molitor; third mention, Alfred M. Githens, all of whom it appears are draughtsmen in the same office in this city.

Work on a large building for the Philadelphia *Press* is about to be commenced at 7th and Sansom Streets, from plans by T. P. Chandler. Mr. Chandler has designed many of the down-town office buildings, but it is some years since his work lay in that direction.



TERRA-COTTA CAP, STATE NORMAL SCHOOL, PROVIDENCE, R. I.
Executed by the Standard Terra-Cotta Company.
Martinl& Hall, Architects.

This is to be an example of steel construction with facing entirely of terra-cotta, it being found more economical than brick.

Another large structure is in the office of Wilson Brothers, architects, to be put up for the newly founded gas company that has leased the city's gas works.

The old blue laws against Sunday work were invoked against the contractor for an office building at Broad and Chestnut Streets, the foundations for which are just being put in. It seems the necessary encroachment on the neighboring property for the purpose of underpinning the party wall was objected to by the tenant, so the wily contractor set to work after hours, on a Saturday afternoon, kept at it all night and all next day, and so had the thing completed by Monday morning, to the astonishment, if nothing worse, of the aforesaid tenant. The arrest for desecration of the Sabbath, which followed, had not much result, as it was proved to the satisfaction of the court that the work was one of necessity.



BUILDING FOR S. FAITH & CO., PENN AVENUE AND TAYLOR STREET, PHILADELPHIA.
Hales & Ballinger, Architects.



TERRA-COTTA DETAIL, BLIND ASYLUM, OVERBROOK, PA.
Executed by the Burlington Architectural Terra-Cotta Company.
Cope & Stewardson, Architects.

ST. LOUIS.— Quite a little activity has been noticeable in building circles recently, and no small interest is felt in the prospects of some of the old landmarks recently destroyed by fire, to which reference was made in the February BRICKBUILDER, being replaced by modern fire-proof structures.

The G. A. Fuller Construction Company, of Chicago, have been awarded the contract for a twelve-story building on the site of the old Polytechnic Building, which they promise to have ready for occupancy by the first of the year. The contract is for $350,000, and the building is to be of brick and terra-cotta. Eames & Young are the architects.

Shepley, Rutan & Coolidge are preparing drawings for an eight-story fire-proof commercial building, on the corner of Broadway and Locust Street, to take the place of the old Mermod, Jaccard Building, and Isaac Taylor plans for a warehouse on 3d and Locust Streets.

There are a number of other buildings in contemplation, but the anticipated war has caused some uneasiness in the money world, and negotiations have been suspended in some instances.

The Board of Trustees of the Public Library recently purchased the entire block between 18th, 19th, Olive, and Locust Streets, which will eventually be the location of the library. The building will not be commenced for several years, a proposition to levy a tax for that purpose having failed to receive the requisite number of votes at the last election, and it will be impossible to resubmit the matter for more than a year.

The methods of our school board were so unsatisfactory that the legislature, last winter, was prevailed upon to pass a bill reorganizing the same. Later an election was held, which resulted in the election of a non-partisan board, and Mr. Wm. B. Ittner was appointed Commissioner of Buildings. Mr. Ittner has just awarded the contract for five school buildings that prove of especial interest, they being the first to be erected under the new building ordinance, which requires all school buildings to be fire-proof, and the cost is less than similar buildings of ordinary construction under the old régime.

The exodus of the city officials from the old City Hall, which had been promised to occur on the 11th of this month, will be equally gratifying to the public and officials, as some encouragement is offered that we may eventually have a new City Hall, even if it does become old before it is finished.

The building was commenced during the summer of 1890, after plans had been selected in a competition not devoid of criticism. After numerous delays incident to work of a public character, the north and south wings have been so far completed that they may be occupied; but the central portion, which includes the two chambers of the municipal assembly and rotunda, are still to be finished. The city has been handicapped by the meagerness of the building fund, and have been compelled to practise the strictest economy in finishing the building, which in many cases might be open to criticism. This is particularly noticeable in the corridors and stairs. The original scheme doubtless contemplated something elaborate, as the ceilings are coffered and richly ornamented, but the walls have been finished with plain plastering and Tennessee marble, without the suggestion of even a molding.



TERRA-COTTA DETAIL, NEW YORK & NEW JERSEY TELEPHONE BUILDING, BROOKLYN, N. Y.
Executed by the Perth Amboy Terra-Cotta Company.
R. L. Daus, Architect.



TERRA-COTTA LINTEL.
Executed by the New Jersey Terra-Cotta Company.

MEMPHIS. — Contrary to the prediction of calamity howlers and those who considered Memphis doomed after the yellow fever scare of last fall, the building outlook for spring and summer '98 is exceptionally good. Soon after what at first promised to be an epidemic an extra session of the legislature was called and the limits of the city extended, certain bills being passed to enable the authorities to sewer the annexed districts, also a certain portion of the old city where the fever wrought the greatest havoc.

As proof positive that confidence has been restored, it is only necessary to call attention to the clearing-house receipts for February, which aggregated nearly twelve millions of dollars, or more than the combined receipts of Nashville, Tenn., and Atlanta, Ga.; or more than Nashville, Knoxville, Chattanooga, Jacksonville, and Birmingham combined — an increase in Memphis receipts of more than 60 per cent. over February, 1897. Every precaution known to science in the way of sanitation is being taken to safeguard Memphis in the future, and, even if brought here, there will be no possible chance of the dreaded disease spreading.

Ground will be broken in May for St. Mary's Cathedral, to cost several hundred thousands of dollars. Work has already begun on the new Poplar Street School — contract $100,000 — and a syndicate has been formed to build a ten-story hotel. There is also a substantial rumor that in addition to the City Hospital buildings and Market House just completed, the new city administration will build a new City Hall.

Memphis architects are nearly all busy with Mississippi work, which is the most promising field in the South for architects. There is a vast improvement shown in the character of buildings under course of construction, and also some degree of attention is being paid to design, probably due to the influence of Eastern competition.

NEW TRADE PUBLICATIONS.

THE CLEVELAND HYDRAULIC-PRESS BRICK COMPANY has this season issued an elaborate copyrighted publication entitled "Early Religious Architecture of America," containing thirty plates 14 by 17 ins. in size, illustrating subjects especially selected by the company, of the ancient missions and churches of America. The work is a distinct departure in the line of advertisement. Indeed, except for the modest title page and the single advertising sheet at the end, the work would be taken to be a professional publication issued under the direction of an architect who was not only competent to make a wise selection, but was by training and experience enabled to know what to choose. The plates reveal a phase of American architecture which has been appreciated to a certain extent by some of our architects, and yet we imagine to many of them the quality of the work here shown will be a very considerable surprise. The best of the buildings are naturally from Mexico. Indeed, only a few are found within the borders of the United States. The cathedral at Chihuahua, and the work at Aguas Calientes are especially interesting for their architectural merit. The plates are accompanied by a very complete description of the several edifices together with a considerable amount of historical data relating to them. Altogether it forms a publication which will be welcomed by every architect and which ought to be eagerly sought for. This issue is by the Cleveland Company, and though all of the Hydraulic-Press Brick Companies are to a certain extent affiliated and will undoubtedly indirectly profit by whatever advertising would result from this publication, it is a distinctive product of the Cleveland Company, to whom great credit should be given for the excellent manner in which it has been gotten up and for the evident intent to not merely produce a good advertisement, but to publish a book which shall be of distinct worth and interest to every one who has in mind the value of American architecture.

THE ATWOOD FAIENCE COMPANY, of Hartford, Conn., has published an interesting portfolio illustrating a number of the mantels which the company is prepared to furnish in stock patterns in enameled terra-cotta. The plates form a collection which will be of value to those who contemplate the use of such product.

CURRENT ITEMS OF INTEREST.

A LARGE quantity of enameled tiling will be done in the new Town Hall at Revere, Mass., the Grueby Faience Company furnishing the tiles.

THE OHIO MINING AND MANUFACTURING COMPANY, makers of the Shawnee Brick, are represented in New York City by Meeker, Carter, Booraem & Co.

Mr. F. P. PLUMRIDGE, formerly connected with the Hydraulic-Press Brick Company at St. Louis, has associated himself with the Evens & Howard Fire Brick Company of the same city.

DYCKERHOFF PORTLAND CEMENT is used in the new Union Station platforms at Providence, R. I., a job of considerable size, and also in the sidewalks around the State House, Boston.

THE C. P. MERWIN BRICK COMPANY, Berlin, Conn., are supplying the hollow bricks which are being used in Southern Terminal Station, Boston, also the new State Capitol building at Providence, R. I.

THE Celadon roofing tiles have been specified on the building for Mrs. Cole, Copley Square, Boston, of which Dwight & Chandler are the architects. The Celadon Company is represented in Boston by Charles Bacon.

THE PANCOAST VENTILATOR COMPANY are supplying their ventilators for a large government building at Fortress Monroe; Empire Building, New York City; and new round house for the Baltimore & Ohio Railway.

THE BRICK, TERRA-COTTA & SUPPLY COMPANY, Corning, N. Y., have the contract for furnishing the architectural terra-cotta required for the Kaufman building to be erected at Pittsburgh, Pa., Charles Bickel, architect.

THE GRUEBY FAIENCE COMPANY have been awarded the contract for furnishing the tiles for the walls of the restaurants in the new Southern Terminal Station, Boston. They are to be like those used in the Boston Subway stations.

THE EVENS & HOWARD FIRE BRICK COMPANY have closed contracts for supplying 200,000 face brick for the Chicago, Milwaukee & St. Paul Railway Passenger Station at Minneapolis, Minn., Charles S. Frost, of Chicago, architect.

THROUGH their Boston representative, Charles Bacon, the Excelsior Terra-Cotta Company will supply their terra-cotta for the new Mattapoisett School, Charles Brigham, architect, and for the new school at Malden, Mass.; Whitman & Hood, architects.

THE BERLIN IRON BRIDGE COMPANY designed and built the new buildings for the Morse Wool Treating Company at Norton, Mass., and have contracted for building a new power house, car

barn, and steel bridges for the Port Jarvis Electric Railway Company, Port Jarvis, N. Y.

THE CELADON TERRA-COTTA COMPANY'S roofing tiles have been specified on the following new contracts: Residence for William Henderson, Chicago (8 in. Conosera); railway stations at Atlantic and Iowa City, R. I. & P. Ry. (10 in. Conosera and open shingle); school building at Niagara Falls (10 in. Conosera).

E. P. LIPPINCOTT & Co., Baltimore agents for the Excelsior Terra-Cotta Company, have closed contract for supplying the architectural terra-cotta to be used on the new Columbia Law Building at Washington, D. C., and, as agents for the Pittsburgh Terra-Cotta Lumber Company, will supply the fire-proofing for the same building.

THE new Jordan Building, Boston, Winslow & Wetherell, architects, will be supplied with the Sayre & Fisher Company's bricks, through their Boston office. The same company will also supply the enameled bricks to be used in the new Masonic Building of which Loring & Phipps are the architects.

H. F. MAYLAND & Co., manufacturers' agents, New York City, are supplying the Roman buff and gray bricks for several apartment houses being erected in New York City and Brooklyn, for which W. B. Willis is the architect, and also the bricks that are being used in the residence of George Gould, Esq., at Lakewood, N. J., Bruce Price, architect.

THE COLUMBUS BRICK & TERRA-COTTA COMPANY are supplying their bricks on the following new contracts: Public school building, New York City, C. B. J. Snyder, architect; store building, Cincinnati, Ohio, Ball & Taylor, architects; residence, Newport, Ky., Dittoe & Wisenall, architects; parish house, Pittston, Pa., E. F. Durang, architect; residence at Detroit, Mich., Baxter & Hill, architects; Phœnix Block, Knoxville, Tenn., Baumann Bros., architects; stable at Omaha, Neb., Henry Ives Cobb, architect.

WE are in receipt of a very unique paper weight from the American Mason Safety Tread Company, consisting of a strip, some 4 ins. long by 2 ins. wide, of their safety tread. This is handsomely finished in brass and nickel, and forms a novel and attractive weight. Its broad, flat surface makes it particularly desirable for the draughting table, and it is the intention of the company to supply each architect's office with one or more of them as a means of keeping the American Mason Safety Tread and its merits actively before the attention of the profession. Parties desiring one of these paper weights should send their address to the American Mason Safety Tread Company, 40 Water Street, Boston, Mass.

A salesman with eight years' experience in introducing goods among the architects and builders in the territory east of the Mississippi to the coast, wishes to connect himself with a concern dealing in a line of building specialties. Best of references furnished.

Address, SALESMAN,
Care of THE BRICKBUILDER.

A party having several years' experience in selling building supplies in New England, and with an extensive acquaintance among the architects and contractors in the New England territory, desires to connect himself with some concern dealing in general building materials.

Address, C. M. J.
Care THE BRICKBUILDER.

For Sale.

One of the largest and finest Clay properties in the States. The various clays are suitable for all kinds of manufacture in which clays are used. This is a good opportunity for an Eastern party who may desire to engage in the manufacture of all kinds of brick. The clays and base for fire bricks are the best in the country. The property is well developed. For full particulars apply or address, JOHN A. EAGLESON, 64 Irving Place, New York.







Fireplace Mantels.



The best ones to buy are those we make of Ornamental Brick. There's nothing else as good or as durable. Our mantels don't cost any more than other kinds, and are far better in every way—our customers say so. Don't order a mantel before you have learned about ours. Send for our Sketch Book showing 53 designs of mantels costing from $12 upwards.

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(Under Babcock Patents.)



HOSPITAL BUILDING AT EASTERN OHIO ASYLUM FOR THE INSANE, MASSILLON, OHIO.
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THE BRICKBVILDER

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THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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THE BRICKBUILDER is published the 20th of each month.

MR. E. W. GODWIN, one of the brightest and most artistic of the English architects, founded some years ago, shortly before his death, the prize which bears the name of the Godwin Bursary, providing for a course of foreign travel and study on the part of a properly equipped architectural student. Several of the men who have held this prize have come to America and have made some very interesting and salutory comments upon our national architecture, particularly in its constructive manifestations. The latest holder of this prize, in his report to the Royal Institute, had occasion to consider the skeleton construction which has found so much favor in our larger cities. The apparent flimsiness of it, the seeming sham, impressed him quite strongly, and he made a number of comments upon it which are in a measure justified, though they are inspired very largely by his point of view. We are free to say that we do not unreservedly believe in the skeleton construction. It is in a way untried, it presents possibilities of failure which might be very serious, and it is a species of building construction which has been sadly misused. At the same time no intelligent observer can deny that as a system of erecting tall buildings it has come to stay, and that though we may not use it aright, though it has very decidedly objectionable features, at the same time it embodies possibilities which give promise of a healthy and an interesting development. We have learned a good many structural lessons from it, and we have been able to practically solve problems which would be impossible of solution with any of the older methods, and yet we can quite understand how strange, how contradictory, and how altogether bad such a system would seem to a foreigner trained in the conservative methods of the English school of architecture, and with also a very probable lack of appreciation of the practical necessities of which this system is an outgrowth.

In the editorial of last month we had occasion to call attention to the ephemeral character of much of our modern architecture and to express the hope that we were approaching an era wherein structural conditions more approximating those of the Romans might obtain. We cannot, however, believe that these solid Roman characteristics will ever be able to find an enduring place in our street architecture, which is necessarily forced into a thinness of construction, a minimizing of supporting members, which at once necessitates a certain change in the details of expression. It is the custom to characterize the architecture of this period as retrospective. We borrow nearly all of our architectural baggage, and it is not strange that when we attempt to apply historic forms to skeleton construction the result should seem to a stranger incongruous and often shoddy, especially if that stranger does not thoroughly understand the causes which have led up to the particular manifestations in design. Given the necessity for the least possible area of supporting members and the greatest amount of light in the wall surfaces, and we have a condition of affairs so different from anything which obtained during previous historic periods that, though we may use the forms of the Greeks and Romans or copy most directly many of the motives of the Renaissance period, the result is bound to be different, and in the process of assimilation we have very naturally not yet been able to thoroughly unite the details of expression to the general idea. But there is one thing which surely can be said with truth about the tall structures. They are not commonplace, and there is far more hope for a hopelessly bad design than there is for one which is hopelessly commonplace. Up to the time of the Centennial our architecture as a whole was both hopelessly bad and hopelessly commonplace. We have gotten bravely over the latter defect and it looks as if we were developing out of the former.

Theoretically there are two schools of designing a building, one which considers that all the ornamentation of the exterior, the disposition of the parts, should make manifest the constructive lines, while the other considers the ornamentation purely as a matter of decoration, not holding that it is necessarily a part of the construction. The former has a more logical sound; and yet with all the logic which has been expended upon this subject, including such poetic analysis as men like Ruskin have been able to bring to it, it is fair to say that there has yet to be designed a modern commercial building which really honestly shows its construction. Surely none of the skeleton constructions have in any way been able to show what they are built of, and however the theory may be, in fact we construct as best we may, and then proceed to apply ornamentation to the exterior. It goes without saying that as a young nation, as one that is only just beginning to feel its artistic possibilities, we use our ornament blindly, we copy our historical precedents often at random and without reason, and the baldness of our constructive decoration may appeal to a stranger as it evidently has to the Godwin Bursar. And yet this seeming inchoate condition is so essentially an element of development that it is not altogether to be deplored. The conditions of growth were the same during Romanesque development, and, for that matter, during the early Renaissance period. So long as our architecture is not commonplace we can afford to be incoherent, and by sticking to the main motives,

by trying to improve along the lines of least resistance, a development is bound to come even if it is not already here; and though we may not appreciate it until it has arrived or even until after we have gone to the other extreme, we can at least take example from the past, and by keeping at one line of development can be pretty sure in the end to arrive at architecture which is both coherent, reminiscently correct, and is at the same time true to the essential conditions of construction. We shall not achieve development by startling manifestations in design or by endeavor to arbitrarily make our construction fit our ideas of decoration, but rather by working out our construction just as it naturally comes, and then trying to clothe that with forms which seem to produce beauty and fitness, keeping always within safe limits. A very successful architect used to tell his draughtsmen that the best advice he could give them in designing a building was to look through the files of the architectural papers until they had found about the kind of structure they wanted to make, and then go to work and do the same thing, only better. One of our prominent architectural clubs has made a practise in its monthly competitions, of re-designing public buildings, choosing some prominent structure, and asking its members to see wherein it could be improved. It is exactly along these lines that lies our greatest hope, and it does not make any difference if we do borrow our baggage from Rome or Greece, we have the bones. If we consistently and continuously try to improve on the expressions that have already found utterance, using, if we wish, the same forms, the same details of decoration, but striving to make them a little better, a little more fit, a little more approaching our ideas of beauty, the end cannot be in doubt; and though our skeleton constructions, carried out on these lines, may seem thin and unsatisfactory, though the reasons for what we do may appeal only to ourselves, and not be really clear to our own eyes, so long as we design with a definite purpose, and try honestly to cover our architectural forms with as much beauty as we know how to use, we are producing architecture which is certainly above the commonplace, and which is bound to take rank as development.

CLEANING OF OUTSIDE WINDOWS IN TALL BUILDINGS.

A FEATURE of modern commercial structures which has only within recent years received any attention is a proper provision for cleaning the glass in windows without endangering life or limb. There have been a number of patented devices put upon the market permitting both the appearance and the conveniences of the ordinary double-hung sash, but with the mechanism so arranged that the sash can either be reversed and washed from the inside or can be swung in like a casement. As far as we are aware, however, Chicago, which has been the pioneer in so many of the modern developments of commercial architecture, is the first to recognize the necessity for provision for safety in tall buildings. The following is an extract from the ordinance passed March 28, 1898: —

"SECTION 198.— In all buildings of Class I., II., IV., and V., the Windows above the second story shall be so constructed as to permit the cleaning of them from the interior of the Building, unless suitable stationary platforms, balconies, or porches admit safe access to the outside of such windows.

"SECTION 65.— As a means of reference in this ordinance, Buildings erected within the fire limits (sheds and shelter sheds as before described being excepted) shall be divided into classes as follows: —

"CLASS I.— In this class shall be included all buildings devoted to the sale, storage, or manufacture of merchandise, and all stables over 500 square feet area.

"CLASS II.— This class shall embrace all Buildings used as residences for three or more families, all hotels, all boarding or lodging houses occupied by twenty-five or more persons, and all office buildings.

"CLASS IV. and V.— These shall include all Buildings used as assembly halls for large gatherings of people, whether for purpose of worship, instruction, or amusement."

Such action as this is certainly to be commended on every ground, for while there are plenty of men who are willing to risk their lives by climbing out on a narrow ledge ten or fifteen stories above the sidewalk, to clean the outside of the glass windows, their willingness does not excuse the risk which they run, which risk, we imagine, the owners of property, no less than the building inspectors, would be glad to provide against.

ILLUSTRATED ADVERTISEMENTS.

NUMBER eleven of the series of brick and terra-cotta fireplace mantels, of which J. H. Ritchie is the designer, is illustrated in the advertisement of Fiske, Homes & Co., page vii.

The residence of Edmund Hayes, Esq., at Buffalo, N. Y., of which Green & Wicks were the architects, is illustrated in the advertisement of the Harbison & Walker Co., page xv.

A spiral staircase (Guastavino construction), extending through five stories of the Paterson Bank, at Paterson, N. J., Charles Edwards, architect, is shown in the advertisement of R. Guastavino, page xx.



PILASTER CAPITAL FOR BOTANICAL MUSEUM, BRONX PARK, NEW YORK.
Work executed by the New York Architectural Terra-Cotta Company.
R. W. Gibson, Architect.

The Boston Fire-proofing Company illustrate in their advertisement, on page xxii, the American Express Company's building at Boston, Winslow & Wetherell, architects.

A view of the skeleton construction of the new Westminster Chambers, Copley Square, Boston, of which Henry E. Cregier, Chicago, is architect, is shown in the advertisement of the Fawcett Ventilated Fire-proof Building Company, page xxiv.

PERSONAL AND CLUB NEWS.

E. G. W. DIETRICH, architect, has removed his office from 18 Broadway to 15 West 28th Street, New York City.

WOODRUFF LEEMING, architect, has removed his office from 726 Fulton Building to 617 Constable Building, New York City.

THE firm of George & J. P. Kingston, architects, Worcester, Mass., has been dissolved. John P. Kingston will continue the business at 518 Main Street.

EDGAR S. BELDEN and Augustus B. Higginson have dissolved the partnership under the firm name of Belden & Higginson and will henceforth practise the profession of architecture independently. Both have taken offices at 164 La Salle Street, Chicago.

THE third exhibition of the National Sculpture Society opened May 1, in building of the American Fine Arts Society, 215 West 57th Street, New York City.

ON Monday evening, May 2, Mr. Theodore M. Pietsch, lately returned from the Ecole de Beaux Arts, Paris, addressed the members of the Chicago Architectural Club on "Student Life in Paris," special reference being made to those studying architecture. Wednesday evening, May 4, was devoted by the club to Architecture, it being one of the series of lectures given under the auspices of the Central Art Association. At this meeting the following gentlemen spoke: Mr. George R. Dean, "Some Modern Ideas of Architecture"; Mr. Frank M. Handy, "A Plea for More Honest Living"; Mr. Robert C. Spencer, Jr., "Is there an American Style of Architecture"; Mr. Dwight H. Perkins, "Criticism of Architecture by the Public"; and an informal talk by Mr. Louis J. Millet. On the morning of May 5 Mr. Frank Wright delivered a lecture on "Art in the Home." At the same session Mr. William Ordway Partridge spoke on "The Relation of Art to Practical Life."

THE series of five discourses on "Architectural History" given by the Detroit Architectural Sketch Club at the Museum of Art has been a great success.

Norman and Gothic (illustrated), by Mr. J. E. Scripps, and Renaissance (illustrated), by Mr. A. Kahn, of Nettleton & Kahn, architects, completed the course. The large attendance showed the general appreciation and benefit of these papers. They will be repeated in a similar way next season. On March 28 M. B. Burrows was elected a director and J. A. Gillard, secretary, to succeed A. Blumberg.



OFFICE BUILDING FOR ALLIANCE ASSURANCE COMPANY, LONDON.
R. Norman Shaw, Architect, London.

THE T SQUARE CLUB, Philadelphia, held its regular meeting on Wednesday evening, April 20, at which the criticism and award of mentions on the drawings submitted in competition for the cover for the Club Syllabus for the coming season of 1898-99 was taken up. First mention was awarded to Nicola D'Ascenzo; second and third mentions, to Horace H. Burrell.

The annual meeting of the club was held on Wednesday evening, May 11, at which there were present forty-eight members. The treasurer's report showed the club to be on a secure financial footing.

The medals for the competitions held during the past year were awarded as follows: Gold medal, Nicola D'Ascenzo; silver medal, Horace H. Burrell; honorable mention, Charles Z. Klauder.

The following officers were elected for the ensuing year: President, Edgar V. Seeler; vice-president, Adin B. Lacey; secretary, Herbert C. Wise; treasurer, Horace H. Burrell; executive committee, David K. Boyd, Walter Cope, and James P. Jamieson; house committee, Nicola D'Ascenzo, George B. Page, and Frederick M. Mann.

CORNELL GRADUATES, ATTENTION!

ALL men who have studied architecture at Cornell University, no matter what their age may be, are requested to send their names and addresses to Prof. A. B. Trowbridge, Ithaca, N. Y., in order that they may receive data relative to the new Traveling Fellowship, the existing Graduate Fellowship, the new Two-Year Special Course in Architecture, the Illustrated Annual, which is soon to appear, and the competition for an Alumni Hall, which will probably be held in the near future.

The American Schoolhouse. VII.

BY EDMUND M. WHEELWRIGHT.

IN the Latin and English High School of Boston, begun in 1877, is found the first important application of sound principles of architectural planning to the school buildings of this country. The design of this building was in the main based upon that of the best Vienna schools, and while some of the features which here appeared are bettered in the later development of schoolhouse planning, it still remains an excellent building of its class, and in respect to the dimensions of its schoolrooms, 24 ft. in width and 14 ft. in height, it is superior to most schoolhouses since built. It will be seen from the plans that the lighting of its schoolrooms is almost wholly from one side, while light is also borrowed from the corridor windows. The provision made for hanging of pupils' clothing is not satisfactory, closets for this purpose being placed under the windows. Mr. E. P. Seaver, the Superintendent of Public Schools of Boston, writes: "These were not high enough to hang a coat in, and to fold a wet coat and stuff it into such a closet is bad for the coat. After a short experience with these cupboards, they were abandoned, except for caps, books, and other small articles. For overcoats, horses were provided, which stand in the corridor or in the schoolroom, as may be found more convenient." Separate wardrobes on the same floor with schoolrooms, or individual lockers in the basement, are, of course, preferable to this arrangement.

The heating and ventilating system is much less satisfactory in this building than in later schools of its class. In fact, it is absolutely the reverse of the system now adopted, by which the air is made to pass from the corridors to the rooms. In the Latin and English High School the passage of air is from the rooms to the corridors. The heating is by the indirect system alone, and not by direct radiation, while heated fresh air for ventilation is supplied by a plenum fan, the system now recommended by the highest authorities. In this building a supply of but 8 cu. ft. per minute for each pupil was contemplated, while today the laws of Massachusetts require at least 30 cu. ft. per minute for each pupil. This requirement of air delivery marks the notable progress made in the heating and ventilation of our schoolhouses in a generation, for it should be remembered that this building was generally considered, when built, to be the most perfect in all its features of any schoolhouse in the country. Judged by the criterions of its day, the only just criticism this building received was that in regard to the lack of proper provision for the storage of pupils' clothing.



CAMBRIDGE HIGH SCHOOL, CAMBRIDGE, MASS.
Chamberlin & Austin, Architects.

The Latin and English High School was designed by the then city architect, who worked in conjunction with Dr. John D. Philbrick, at that time superintendent of Boston public schools. In a description of this building Dr. Philbrick said: —

"The great fire, which came so near being disastrous to the project, turned out to be one of the causes of its ultimate success, by necessitating delay in building. Had the work gone forward with dispatch, as intended, the edifice erected would have been, without doubt, a substantial and costly one, and fully up to the standard of the best in the country; but it would not have been up to the standard of the best schoolhouses in the world, as this building is, for the simple reason that the knowledge requisite did not exist in this country. The most of the pupils in the public schools of Boston had better accommodations than those of any large city in the world; but we had no one schoolhouse equal to the best in the world. The characteristics of the best schoolhouses in this country were well known to me, and I had some knowledge of school architecture abroad; but it was not until I visited the Akademische Gymnasium, in Vienna, at the time of the Universal Exposition of 1873, that I was able to picture in my mind the image of such a building as we wanted in Boston for these two schools. The study there begun was followed up by visits to other first-class high-school buildings, not only in that city of wonderful schools, but in all the principal cities of Germany. In this way a valuable collection of views, plans, and descriptions of the best specimens was obtained.

"In respect to school architecture, while we made a better showing than any other American city, we were quite eclipsed by some of the European cities; that is, in some of the foreign cities schoolhouses have recently been erected which are architecturally and pedagogically superior to anything we have to show. The city of Vienna has individual school buildings vastly better than the best in Boston; but if you take all the school buildings in Vienna, the good and bad together, the average accommodations afforded to all the children of the city are perhaps not equal to the average of the accommodations provided for the children in Boston. What I mean to say is this: that Vienna knows how to build, and has built school edifices which are more durable, more safe, more convenient, more costly, and more beautiful, than any Boston has yet built, or is likely to build in the near future. The reason of this is, that in Vienna, when a schoolhouse is planned, it is done by the combined science and wisdom of the most accomplished architects and the most accomplished pedagogists. No mere whim of a schoolmaster, and no mere whim of an inexperienced and uneducated architect is allowed to control the design."

"In its general arrangements the block plan consists of a parallelogram 423 ft. long by 220 ft. wide, the longest sides, or main buildings, fronting on Warren Avenue and Montgomery Street, the Latin School occupying the former, and the English High School the latter.

"There are two courts within this block, of equal size, the division between the two being made by the location of a central building which is connected with the two main street fronts by means of a transverse corridor. These courts, as the plan shows, not only afford the most desirable advantages of light and air, but also serve the purpose of separate playgrounds for the pupils of each school.

"Across the easterly end of the block and connecting its two sides are located the drill hall and gymnasium; and across the westerly end, fronting on Dartmouth Street, a building, as shown on the plan, is proposed to be erected hereafter, as has been mentioned, for the accommodation of the school board and its officers.

Each of the street fronts of the main buildings is divided into three pavilions, — one central and two end pavilions, — the central pavilion being more pronounced in its proportions as to width and height. The main buildings have three stories and a basement, the latter being a clear story facing the courts.

"The arrangement of the plan is simple; longitudinal corridors extend the full length of the main buildings and parallel with the

street fronts. In the central pavilions, opposite the ends of the transverse corridor, and at its intersections with the longitudinal corridors, are placed the two grand entrances, one from each street. These entrances are a feature in the design, both internally and externally, ample space being given at the intersections of the grand corridors where they are located for the placing of statuary. There are also four other entrances from the streets, two in each main building, at the terminations of the longitudinal corridor, one being in each end pavilion.

"There are eight staircases, one in each end pavilion, connecting with the entrances at the terminations of the longitudinal corridors, and two in each of the central pavilion, right and left of the grand entrances respectively.

"The drill hall, another feature in the design, is on the street level. It is 130 ft. long on the floor by 62 ft. wide and 30 ft. high; above the galleries, which are at the ends, it is 160 ft. long. The seating capacity of floor and galleries is sufficient for twenty-five hundred persons. It has four broad entrances: at the ends, from Warren Avenue and Montgomery Street; at the sides, from Clarendon Street and the eastern court. The floor is of thick maple plank, laid in a solid bed of concrete. It is finished in natural materials, and is so treated as to get a constructional effect of open timber work, the wood being of hard pine, shellacked and varnished, and the interior walls of Philadelphia face brick, laid in bright red mortar, and trimmed with buff sandstone.

"There are forty-eight schoolrooms, twenty being on the first and second floors respectively, and eight on the third floor; twelve receive their light from the courts, the remaining thirty-six occupy the street fronts. The typical schoolroom of this building is intended for thirty-five pupils, but will accommodate forty or more, according to the mode of seating and the size of the pupils. It is 32 ft. long and 24 ft. wide and 14 ft. high. It is lighted by four windows, 9 ft. 6 ins. by 4 ft. 6 ins., placed on the longer side 6 ins. from the ceiling and 4 ft. from the floor, and equally spaced, with transom sashes hung, as shown in the cut, above the sliding sashes. It has, on the side opposite the windows, two doors opening from the corridor; over the doors are top lights for ventilation, and between them two high lights hung on hinges. The pupils face the platform at one end of the room, and receive the light on their left. Under the windows are cabinets for coats and caps, there being no separate rooms for this purpose. There is a closet sunk into the end wall, where the platform is, for a teacher's wardrobe. This description applies to most of the rooms, and where there is a variation from it the difference is not essential.

"The assembly halls are on the third floor, in the central pavilions, are 82 ft. long by 62 ft. wide, and 25 ft. high, each having a seating capacity for eight hundred and fifty pupils, with the amphitheater arrangement.

"The library rooms are on the first floor, on the right and left from the transverse corridor in the central building, each being 54 ft. long and 32 ft. wide, with octagon ends to catch the light at different angles. They are furnished with bookcases against the wall on all sides, excepting the door spaces, made of light oak, about 6 ft. high, with glass doors. The windows come down to the top of the bookcases.

"Over the libraries, and of the same size and shape, on the second floor, are the lecture halls for the natural sciences. Each of these has two conveniently connected rooms — one for physical apparatus and the other for specimens of natural history.

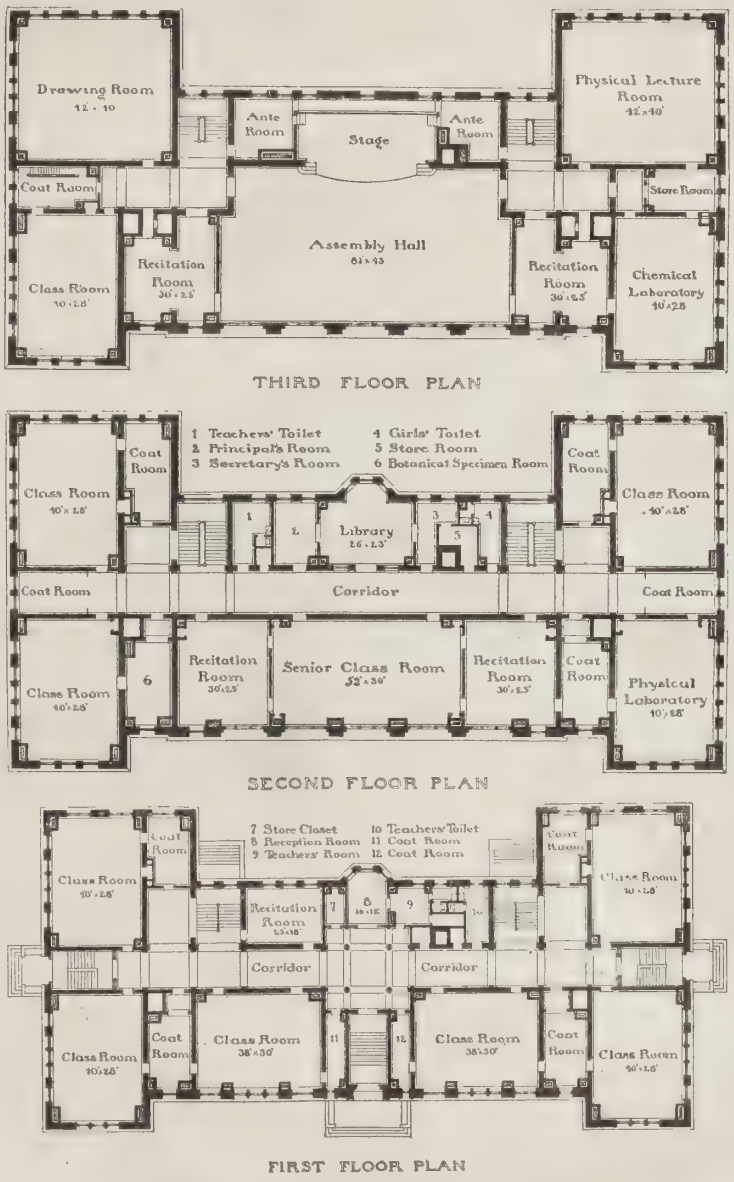
"Near the principal entrances, on the first floor in the central building, there are for each school a teacher's conference room, with an adjoining reception room, a head master's office, and a janitor's room; on the second floor adjacent to the transverse corridor are two suites of apartments, each having four rooms, for janitors' dwellings, each suite being connected with the basement by a separate staircase.

"In the central pavilions, at convenient locations on each floor, there are ample dressing rooms for the accommodations of the teachers. The water-closets and urinals for the pupils are located in four sections winged out from the principal staircases in the central pavilions, and are arranged in tiers, there being two stories of closets to each story of the building, one of which is entered at the corridor level, and the other from the half landing of the staircase above. There are six of these tiers in each section, which are connected by a spiral staircase in a round tower at the exterior angle running from the basement to the roof of the building, the top of which is surmounted by a large ventilator. By other means in addition to this the closets are completely ventilated. There are two spacious drawing rooms for each school on the third floor — one for model drawing and the other for copy drawing, both having side and skylights at either end; at either end is a room for the safe keeping of the models and copies.

"In connection with the drill hall there are two rooms for the military officers, and an armorer's room, furnished with a work bench and the requisite tools.

"The extensive basement, besides the space necessary for the steam boilers and the storage of fuel, affords a covered playground for the pupils.

"A part of the English High School basement has been fitted with every desirable convenience for the occupancy of one of the



CAMBRIDGE HIGH SCHOOL, CAMBRIDGE, MASS.

branches of the Public Library. It is to be hoped that one or two of the basement rooms may be utilized as a refectory where the pupils may obtain a wholesome lunch at a moderate price.

"No chemical laboratory was supposed to be needed by the Latin School, and hence none has been provided; but the provisions for the instruction in chemistry on the English High School side are believed to be as near perfection as has yet been reached, having regard to the objects and grade of the institution. The portion of the block appropriated to this purpose is architecturally a detached building located at the east end of the high school building and facing Montgomery Street, and between it and the southerly end of the drill hall, being separated from the rest of the edifice by fire-proof walls, as far as convenience of access would allow.

"The lower floor is occupied by a lecture room 35 by 40 ft., and capable of seating about one hundred pupils. The room is constructed with rapidly rising tiers of benches and is fitted with a lecture desk and the ordinary appliances of a chemical lecture room.

"On the second floor are the laboratory and accessory rooms. The former is of a general rectangular shape 35 by 30 ft., with an alcove 27 by 7 ft., and is surmounted by a dome-like roof, from the center of which rises a short steeple or cupola. Of the interior arrangements the working benches of the pupils are the chief feature. These occupy the middle area of the room and will accommodate forty-four boys at any one time.

"Connecting with the laboratory are two small side rooms. One is for storage of apparatus, and can be darkened for spectroscopic experiments. The other is a preparing room, but is fitted with working desks and drawers, and is used also as a store-room for chemicals.

"Practically the buildings are fire-proof throughout. The corridors are all constructed with iron beams and brick arches, and laid with a finished floor of black and white square Italian marble tiles. The under sides of the arches over the corridors are plastered upon the bricks, and the beams covered with a heavy coating of Keene's cement upon wire network, these corridors, in themselves, dividing the whole block into four fire-proof sections. The several apartments are separated by brick walls, and all the floors and the spaces between the furring upon the walls are filled with fire-proofing. The staircases are wrought or ornamental iron-work, built into the brick masonry.

"The floors and the platforms of the rooms, with the exceptions already mentioned, are of Southern hard pine, while the standing work is of the best white pine, grained and varnished, with the exception of the corridors, where it is painted in parti-color."



ENGLISH HIGH SCHOOL, BOSTON, MASS.
George A. Clough, City Architect.

In a closing generalization Dr. Philbrick speaks of the leading characteristics of the building and notes features unique in American school architecture.

1. The arrangement of interior light courts.
2. The hall for military drill.
3. Toilet rooms on each floor.
4. Fire-proof construction.

Dr. Philbrick was inclined to the opinion that there could not be a first-class schoolhouse of any considerable size in which the interior court plan is not applied. This cannot be readily accepted, for while the court plan has many merits, it requires great depth of lot if any important rooms are to receive their light therefrom.

Other features are noted as unique at that time in the schoolhouses of this country.

1. The detached location of the chemical building.
2. Sufficient separate room set apart from gymnastic exercises.
3. The provision for conference rooms for teachers, and offices for head masters and janitors.
4. The iron staircases with rubber mats.

Dr. Philbrick's defense of the size of schoolroom adopted is as follows:—

"It remains now to specify with distinctness the leading characteristics of this edifice, which in their combination constitute its superiority over other school buildings heretofore erected in this country, and render it so interesting as a study both by school men and architects.

"1. A mere glance at the plans reveals at once to the eye of the expert the capital peculiarity of this block, which of itself renders it unique in American school architecture, namely, its arrangement around interior courts. This, I believe, is the first instance of the realization of this court plan or idea on a considerable scale in any school building in this country. The most serious defects in our large schoolhouses have resulted from the ignorance or disregard of this idea by our architects. This idea is distinctly foreign in its application to schoolhouses. It is Mr. Clough's great merit that he is the first to give it a practical application in this country. The principle may be thus stated: So plan the building that it shall be in no part wider than the width of a schoolroom with the width of the corridor added. We have college and other educational buildings with wings at right angles to each other, but not planned in accordance with this principle. The superiority of this court plan over what may be called the solid plan, which has hitherto prevailed, is found more especially in the advantages it affords for light and air. So important do I consider this idea in schoolhouse building that I doubt whether there can be a first-class schoolhouse of any considerable size in which it is not applied. The disadvantages of the solid plan may be appreciated by comparing our two most conspicuous examples of it, the Massachusetts Institute of Technology and our Girls' High School, with this block.

"2. The perfection of the schoolrooms is another of the more important characteristics. It has been said that the rooms are not large enough. One might as well say that a bushel measure is not as large as it should be. The rooms are as large as they need be for the objects in view in planning them; and, in fact, a margin was allowed for a change of views with a change of management.

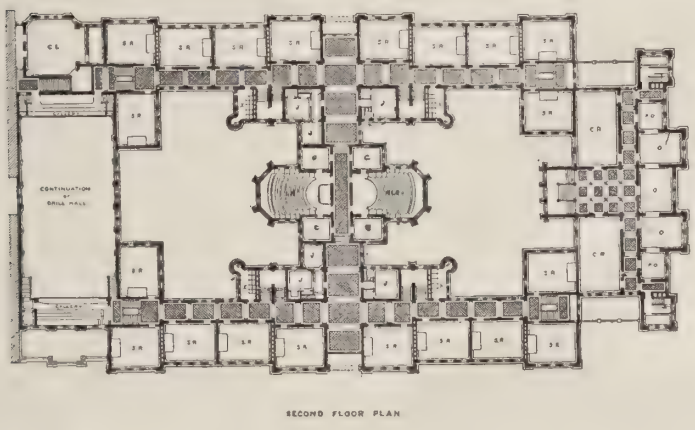
"My conclusion, then, is that the schoolrooms of this edifice, taken as a whole, considering their size, proportion, ventilation, and lighting, place it without rival in this respect among schoolhouses of its class."

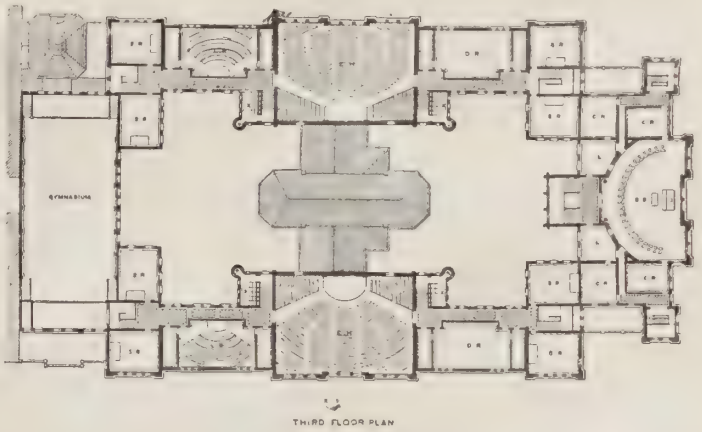
The foregoing description makes evident how important the building was in the history of American school architecture, and it will be recognized that many of the features developed in its

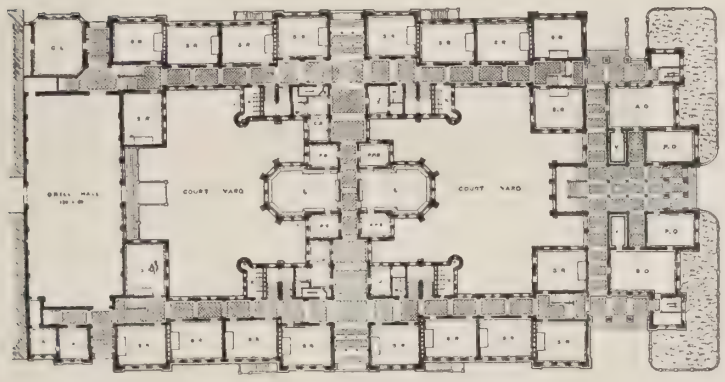
construction have greatly influenced schoolhouses subsequently built.

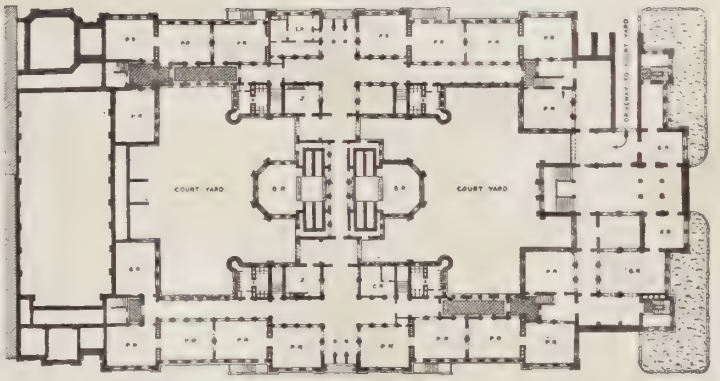
It would have been well if the relatively narrow schoolrooms of high stud here built had been generally adopted in later schoolhouses. The schoolhouses recently built in New York City have these desirable characteristics.

We will consider again the Cambridge High School, in which is found a building preeminently distinguished not only for the beauty of its design, as previously noted, but for the excellence of its plan. The exterior walls of the basement of this building are of Milford granite, and the first story is of Amherst stone, the second and third stories are of light red Perth Amboy terra-cotta brick with trimmings and cornice of Amherst stone. The design and material used in this building are richer than is generally found or is generally advisable even in a high school house. This fine building was built by the city in recognition of the generous public gifts of a former citizen, among









ENGLISH HIGH SCHOOL, BOSTON, MASS.

these gifts being the site for this school. A notable feature of the plan are the "emergency" or "hospital" rooms for use in case of sudden illness. These rooms are provided more especially for the girl pupils. The office of the head master, the library, and the office of the secretary of the board are placed in conjunction, and all these rooms are arranged for library purposes. The books are all placed on open shelves, so that the free use of the library by the pupils is encouraged. The library is not only used as a place for study, but it is sufficiently large to serve at the same time for a recitation room for advanced classes.

In his report the head master of the school gives the following description of the laboratory accommodations: —

"1. A physical laboratory, with a demonstration table for the teacher, chairs with writing-arm attachments for a class when seated, tables with supports for apparatus and lockers for storage, side tables with gas and water.

"2. A smaller connecting room, with shelves and cases for such physical apparatus as the pupils personally use, and a working table for the teacher and for advanced pupils or special students.

"3. A chemical laboratory with one hundred and twenty-eight lockers, so that each pupil may have his own equipment and be held responsible for its care. The room contains a chemical hood where a dozen pupils may work at once with noxious gases, also shelves for the storage of such supplies as are in daily or frequent use.

"4. A smaller connecting room with shelves and cases for supplies, books, balances, and the various materials used in chemical study. This room contains a table supplied with gas and water, and is intended for the use of the teacher or of special students under the teacher's immediate guidance.

"5. A small, dark room, with sink, shelves, gas, and electric lamps for photographic purposes.

"6. A large lecture room with a raised floor, and chairs for from one hundred to one hundred and fifty pupils, each chair having a shelf to facilitate the taking of notes. Here the teacher of physics or chemistry, or, in fact, of any subject, may assemble pupils in larger numbers than usual for talks, lectures, and such experiments as are better performed for the pupils than by them. This room contains closets for storage, cases for lecture table apparatus, a well-appointed demonstration table, a stereopticon screen, and a porte-lumiere. Its windows may be darkened at short notice. This room, as well as the five rooms just described, is provided with hot and cold water.

"In addition to the six rooms already described there is a botanical room, with drawers for the school herbarium, cases for botanical specimens, window shelves for plants and water; also a mineralogical room and a spacious drawing room, the latter to receive the tables, models, screens, and other equipment of the evening drawing school."

The school has a capacity of 692 desks.

COOPERATION BETWEEN ARCHITECT, ENGINEER, AND TERRA-COTTA MAKER.

THE CONSTRUCTION OF BALCONIES.

BY THOMAS CUSACK.

WE have taken it for granted that the architect and engineer — individually or jointly, directly, or through capable representatives — have studied the necessary points of contact between terra-cotta, steel, brick walling, and such other materials as chance to intervene. We shall further allow it to go unchallenged that they have agreed upon what appears to them a very satisfactory arrangement. It does not by any means follow that there is no room for improvement, or that it is not open to many, it may be, very serious objections when examined by the terra-cotta maker from a manufacturer's, or by a practical mechanic from a builder's point of view. We have good reason to know that the underlying facts do not furnish an adequate basis for such a hopeful assumption on their behalf. In fairness, however, to members of the professions referred to, let it be said that they do not all lay claim to a monopoly of the inventive faculty, or to an unerring judgment as to everything connected with building practise. The more distinguished of the number would, we suppose, be as ready to disavow any share in such pretensions as they are to acknowledge and act upon duly accredited suggestions. Speaking from an active experience of many years, we can say without hesitation that an architect's success is usually about equal to the use made of his unrivaled opportunities for obtaining the exact measure of things that may look well on paper, or sound plausible as an abstract theory. If he is true to himself and to his client, he will not allow such inestimable advantages to pass unimproved.

A noteworthy indorsement of all this was made a short time ago by the father of skeleton construction, Mr. W. L. B. Jenney, a man whose right to be heard on such a subject will not be disputed by either architect or engineer. One pregnant sentence will suffice: "It is desirable, whenever practicable, to consult with the terra-cotta company before the details are finally settled, as they must furnish and set the material, and sometimes very valuable suggestions can be obtained from them contributing to its stability and economy." Men of assured position can afford to do this, in the way indicated, without the least fear as to their professional dignity. The ablest and most successful among them gladly avail themselves of a privilege which, if enjoyed at all, is not shared to the same extent by the members of any other profession. It is the fledglings and failures that get hopelessly lost, while posing upon a pedestal of unapproachable superiority, making up in supercilious airs what they lack in solid acquirements. There can be no loss of dignity on the part of an architect in seeking to know as much as may be about the practical side of anything on which he is engaged, particularly so while he reserves to himself the undisputed prerogative of approval or disapproval. As applied to the recent development of steel and terra-cotta construction, these remarks have a special significance. It is a new problem, and one of unusual complexity, but the best solution will be found in an unbiased interchange of workable ideas.

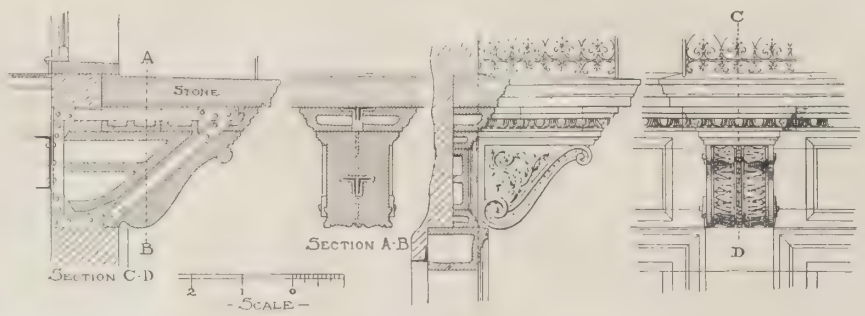


FIG. 53.

The manifold evils resulting from an opposite line of procedure are often costly, and nearly always vexatious. When, for example, an engineer has a balcony or other projecting member to support, he usually sets about it with the uncompromising directness to which he has been accustomed in work of a purely engineering character. The balcony in question, though not a strictly utilitarian adjunct to the building, may be prized by the architect as a somewhat desirable feature in his design; therefore craving a more ornate treatment than would be expected on a mere fire-escape. To that end the iron anatomy must be concealed — probably embellished — by the use of a material in which it is possible to obtain a higher degree of architectural form and finish. The engineer himself would, doubtless, concede as much (in theory) should the point be presented in that light, yet if called upon to modify a preconceived idea, or to depart from an established practise, his leanings would, we fear, be found strongly conservative. To make the use of iron or steel subordinate to that of any other material is to him a doctrine of doubtful validity and one which he is not inclined to encourage. His early training and subsequent associations run in an opposite direction, becoming, in time, a habit of thought not easily overcome. In his eyes the building itself takes the form of a huge cantilever set on end, from which these platform supports must be projected only on approved engineering principles. A certain priority as to the progress of execution enables the contracting engineer to forge ahead unmindful, it may be, of subsequent embarrassments from which he will not, in all probability, be called upon to suffer. Nor is this the only fortuitous advantage, on his side, of which he is naturally disposed to make the most. Fellow-contractors less favorably situated may have reason to complain of his lack of cooperation, in these respects, but as to them he calmly assumes that, "Where sits McGregor, there is the head of the table."

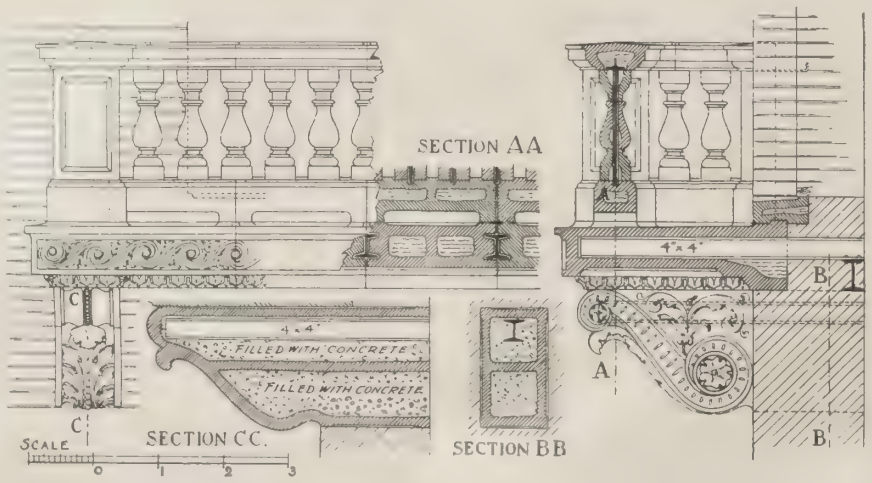


FIG. 54.

Left to himself, an engineer would provide for the needs of a terra-cotta balcony after the manner shown in Fig. 53. Not only would he frame his triangular support in that fashion; the chances are that, unless restrained by imperative orders, he would likewise make permanent riveted connections between it and the structural framing, thus manifesting an utter indifference to the claims or requirements of any other material. Indeed, we have known this to be done by an eminent member of the fraternity referred to, in the erection of a building on which a number of such balconies occurred, notwithstanding a warning to the contrary

sent by way of anticipation. How this steel triangle was to be inserted in a terra-cotta bracket without first cutting away all the interior partitions and thereby reducing it to a mere shell was an important detail that did not seem to concern him. This was one of the things which he did not understand, and about which he would not take the trouble to inquire until his attention had been called to the oversight by a superintendent of unusual firmness and intelligence. He would not allow the terra-cotta bracket to be mutilated, or its strength in any way impaired, and so the trouble (in this case, at least) recoiled upon those who had caused it. In fact, the heads had to be cut off the rivets, and the steel bracket taken apart so far as to allow the diagonal strut to pass easily through the slot provided for it. The connections were then fastened again — this time with bolts instead of rivets — just as the terra-cotta maker had requested in the first instance.

One other notable circumstance may be mentioned in this connection. It was noticed that while two men were at work undoing a dozen or so prematurely fastened triangles, two other men working for the same firm were as persistently engaged (at another part of the same building) riveting similar brackets in position. They, too, were in turn taken apart for the same reason, to be reconstructed exactly as the first. The man in charge, when spoken to about this curious coincident, explained that they had been "got out that way at the works," and that he would keep on riveting until his present orders had been countermanded. It would seem that "some one had blundered," for though there were a score or more such balconies on the building, he stuck to his text, doing and undoing until the end of the chapter. This was a case of unmitigated red tape plus a predilection for rivets.

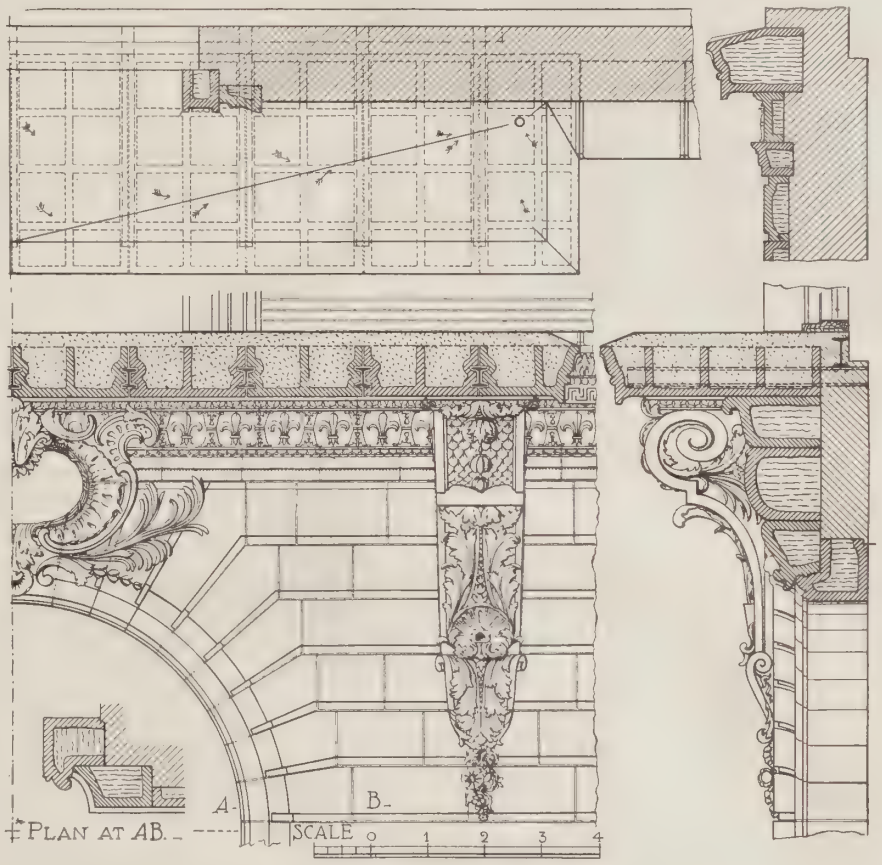


FIG. 55.

The construction of these balconies was in the main quite practicable, and had it been taken up in a spirit of mutual helpfulness neither side would have had any reason to complain. It but required reasonable forethought and intelligence to determine the readiest way in which the several parts of the two materials could be assembled so as to accomplish the final result aimed at by the architect. Work of this kind resolves itself into a well-considered compromise between different materials, each of which has some compensating advantage. To this end there must be mutual concessions, together with a total absence of prejudice on the part of those whose business it is to make the best possible disposition of available resources.

In the particular case under notice we think that these terra-cotta brackets could have been reenforced by a simpler and much less expensive method. Into the upper chamber of each we would have inserted a 3 by 5 in. I beam, the end of which could have extended to within 1½ ins. of the face of bracket. The remaining cavities having then been filled with concrete, the brackets would have been bonded into the 1 ft. 4 in. wall without further ado. The projection would, of course, be shored up until a sufficient countervailing weight of walling had been built on the other end. A balcony so formed would be capable of sustaining at least ten times the weight ever likely to be placed upon it.

In the last example a stone platform was used as a matter of choice, rather than one of necessity. At Fig. 54 we show a somewhat different arrangement, terra-cotta being the material used throughout. The brackets are strengthened in the manner described in last paragraph, not that they really needed any auxiliary support, but as an extra margin of safety. A 5 in. I beam is laid on the top bed, the ends of which extend a foot or so into each jamb of window above. To this is attached the 4 by 4 in. I beams inserted in joints of platform, the blocks themselves forming the fulcrum. These blocks are made with raised joints and a wash towards outlets in the base under balustrade. In each baluster there is a ½ in. rod which passes through a ¼ by 3 in. continuous bar, for which provision is made in bottom bed of capping. This bar enters the dies, returning at right angles into main wall, thus securing the whole balustrade against lateral deflection.

Turning to Fig. 55, we have a platform over an entrance, calling for another scheme of construction. It, like the preceding example, is one in which the terra-cotta manufacturer had something to say, and that at the invitation of an architect who believes in the principle of co-operation for which we have been contending. In this case it became necessary to provide for a cantilever at every joint, the blocks being molded to fit snugly on the flanges. Considerable leverage is obtained by placing a 5 in. I beam on top of the cantilevers, and across the window openings above, each end extending into wall far enough to receive all the cantilevers. The whole of the blocks having been adjusted to line, resting the while on a level staging, the cellular top bed was then filled solid with concrete graded towards outlets, and floated off in granolithic cement.

Terra-cotta being the material used above the granite base (Fig. 56), the architect, on that account, preferred using it for the platform also. This was quite apart from the question of cost, though the difference between it and stone would have amounted to a substantial item. These ten separate blocks, joined together in the manner indicated, became a monolith of considerable strength, which, being free from joints on the finished surface, could be made to shed water at will in any direction. The principle of composite construction embodied in this example, in which steel and cement are made to supplement the limitations of terra-cotta, is capable of the widest application in modern building practise. Where one is weak the other two are strong, and so the sources of strength outnumber the elements of weakness at the ratio of two to one. How

to obtain the nearest approach to an equation of strength between the several components is an epitome of the whole question. It



FIG. 56.

will be answered best by those who study the physical properties of each, and who have also had a close practical acquaintance with the use of them under exacting diversified conditions.

A NEW TRAVELING SCHOLARSHIP.

CORNELL UNIVERSITY is offering a traveling scholarship to its graduates. "Since," as they say, "there are many objections to the prevailing method of conducting foreign scholarships, viz., that of traveling and making measured drawings, and since there is as much opposition to the idea that Americans must go to France for an architectural education, the Faculty of the College of Architecture has decided upon a course which is at the same time a departure from and a compromise between these two systems." The value of this scholarship will be $2,000. It will be awarded by competition to men under thirty years of age, and the winner will be required to spend two years in advanced studies at Cornell and in Europe under the direction of the faculty. The first of these prizes will be awarded this fall, and others, it is expected, will be awarded on alternate years thereafter. The course pursued differs somewhat from that usually taken in regard to these traveling scholarships. Instead of spending the time in traveling and making measured drawings, or going to France, entering the L'Ecole des Beaux Arts, the holder of the fellowship will spend the first eight months of each year at the university pursuing advanced studies, and four months on a European tour. For the award of this scholarship two competitions will be held. The first has for its purpose the selection of candidates for the second or final competition. The first problem will be one that can be executed at home in ten days, so restricted in size of sheet and elaboration of details that the average competitor can readily prepare his drawing in ten evenings. The second will be executed in four weeks at Cornell University in the College of Architecture. Seven will be selected from the first competition who may compete in the second, and here will be awarded the prize to the successful candidate, and a first and second mention to the two next best.

Brick and Marble in the Middle Ages.

BY G. EDMUND STREET.

CHAPTER IX.

"A sea
Of glory streams along the Alpine height
Of blue Friuli's mountains." — *Childe Harold.*

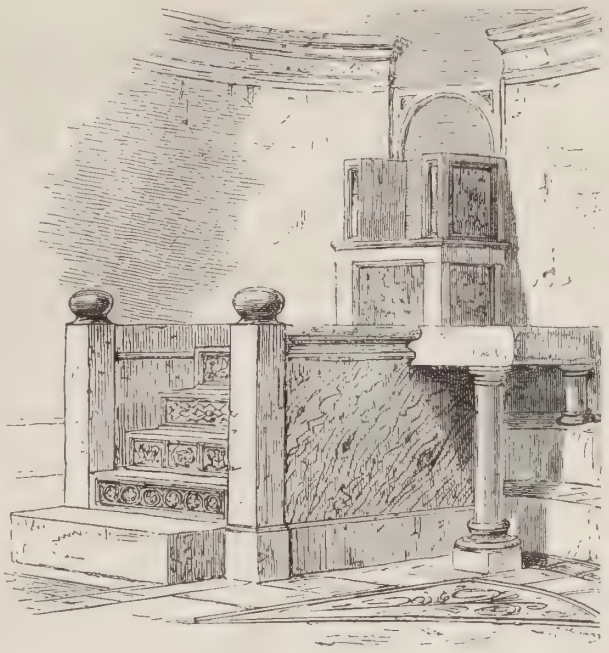
New Roads to Venice — The Pusterthal — Innichen — Dolomite Mountains — Heiligenblut — Kötschach — Kirchbach — Gail Thal — Hermagor — Ober Tarvis — Predil Pass — Gorizia — Aquileja — Grado — Udine — Pordenone.

TO those who wish to find new roads to old haunts let me recommend the road to Venice described in this chapter. A more interesting way for any one who has already travelled through Lombardy to Venice cannot be desired. It affords a sight not only of charming scenery, primitive people, and churches of some interest, but gives an opportunity for a visit to Aquileja, Grado, and Udine, all of them places well worthy to be known by all lovers of architecture. Leaving the Brenner railway at Franzensfeste, we made our way first of all to Innichen. Here I found a very fine Romanesque church which, placed as it is not very far to the north of the distant mountains which one sees from Venice, and full as it is of Italian influence in its general design, may well be included in my notes. It is a cruciform church with a central raised lantern, three eastern apses, a lofty south-western tower, and a fifteenth-century narthex in front of the rest of the west end. The nave is divided from the aisles by columns which are, (1) ten-sided, (2) four half columns attached to a square, and (3) octagonal. The first and third are massive columns decreasing rapidly in size from the base to the capital. The central lantern has an octagonal vault upon very simple pendentives, and the apses have semi-dome roofs. A fine south doorway has the emblems of the four Evangelists, sculptured around Our Lord in the tympanum. Innichen is a small and unimportant village, but boasts, I think, of no less than five churches; and fine as is the mother-church, I suppose most travellers would agree with me in thinking the background of mountains to the south of it, the most delightful feature of the place. Truly I know few things more lovely than the evening view of the church and village, with the tall fantastic peaks of the Dolomite Drei Schuster behind, lighted up with the glowing brilliancy which is so characteristic a result of the Dolomite formation, by the last rays of the setting sun. Below all was gloomy, dark, and shaded; above the whole series of towering peaks seemed to be on fire, and most unearthly did they look. The attraction of such sights as I had seen before compelled me to give a day to an excursion southwards to the Kreuzberg pass, to have a glimpse, at any rate, of the Auronzo Dolomites, and I had no reason to repent the day so spent.

Leaving Innichen and going eastward, we went first to Lienz; then, after a *détour* to Heiligenblut, we crossed from the Pusterthal to the Gail Thal, and from thence across the Predil pass to the Adriatic at Gorizia. From Innichen till we reached the Italian seaboard, we saw and were much interested in a series of churches, generally of the fifteenth century, and all built apparently by the same school of German architects. They are small mountain churches, and are mainly remarkable for the complicated and ingenious character of their groined roofs. They have usually aisles, columns without capitals, and no distinct arches between them, but only vaulting-ribs. The panels between the ribs are often ornamented with slightly sunk quatrefoils, or in some cases regularly filled with tracery.

One of the best of these churches is that at Heiligenblut, in Carinthia. Here, where the main object of every one is the exploration of the mountains grouped around the beautiful snow-peak of the Gross-Glockner, it is not a little pleasant to find again, as at Innichen, a remarkable church just opposite the inn-door. This was built as a pilgrimage church to contain a phial of the sacred blood, and is ex-

tremely interesting architecturally as a church, built with a regular system of stone constructional galleries round the north, south, and west sides of the nave. The aisles are narrow and divided into two stages in height — both groined — and the upper no doubt intended for a throng of people to stand in, and see the functions below. Now, however, just as in most modern galleries, raised tiers of seats are formed in them, and their effect is destroyed. A pretty Retable at the end of the north gallery suggests that originally perhaps they were built in part to make room for side altars, but this was clearly not the primary object. The fronts of the galleries are covered with paintings of no merit, which illustrate the beautiful legend of S. Briccius, who is said to have brought the phial of blood from the East, and to have perished with it in the snow just above Heiligenblut. There is a crypt under the choir, entered by a flight of steps descending from the nave; a grand Sakramentshaus north of the chancel where the holy blood is kept (not over the altar); and there is a lofty gabled tower and spire on the north side of the chancel, whose pretty outline adds not a little to the picturesqueness of the village.



PATRIARCH'S THRONE, AQUILEJA.

From Heiligenblut, looking at churches by the same hands on the way at S. Martin Pockhorn and Winklern, we made our way back to Lienz, and thence, crossing the mountains, descended on Kötschach in the Gail Thal, passing a good church on the road at S. Daniel.

Kötschach is in one of the most charming situations for any one who can enjoy mountains of extreme beauty of outline, even though they are not covered with snow to their base, nor are more than some nine thousand feet in height. To me this pastoral Gail Thal, with its green fields, green mountain sides, wholesome air, and occasional grand views of Dolomite crags, among which the Polinik and Kollin Kofel are the finest peaks, is one of the most delightful bits of country I have ever seen. At Kötschach the architectural feature is a fine lofty gabled steeple with an octagonal spire. It is very remarkable how German these Germans are! Here, close to the Italian Alps, we have a design identical with those of the fine steeples of Lübeck, and as vigorously Teutonic and unlike Italian work as anything can possibly be.

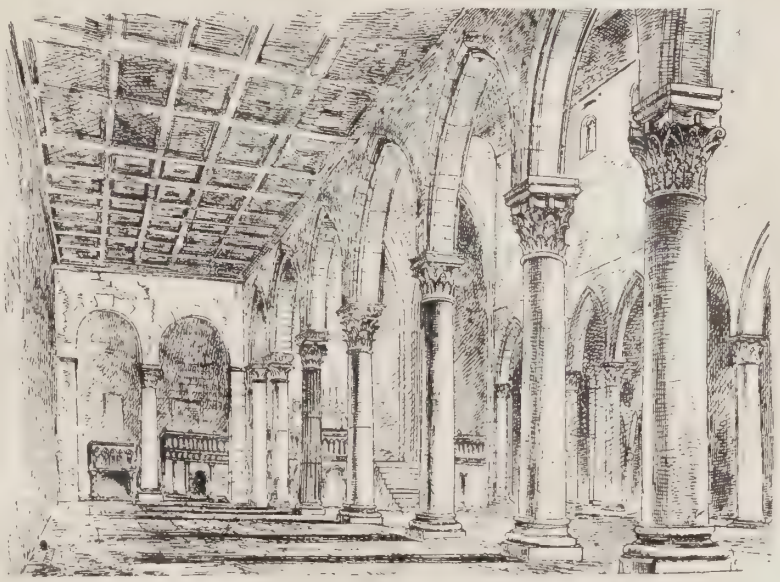
From Kötschach a pleasant road runs down the valley to Hermagor, another charming little town beautifully placed, and with — no small attraction — a capital hostelry. On the road, at Kirchbach, the drivers of the country waggons in which we were travelling pulled up their horses, to my no small delight, in front of a most interesting mediæval church yard-gate; this is a simple archway overshadowed by a shingled pent-house roof, to whose kindly guardianship we owe it that a fifteenth-century painting of S. Martin dividing his cloak with the beggar, and several saints under craftily-painted canopies, are still in fair preservation on the wayside gate, making one of the most lovely pictures possible on the road.

At Hermagor, where the grand and massive mountain range of the Dobratsch to the east, and the Gartner Kogel to the west, give never-failing pleasure to the eyes whichever way they turn, there is another fine church, very much of the same character as that at Heiligenblut, but without galleries.

Between Hermagor and Ober Tarvis the churches are not important, but one in the village of S. Paul has the unusual feature of a cornice under the external eaves effectively painted in the fifteenth century, with elaborate and very German traceries in red and buff, which are still fairly perfect.

At Ober Tarvis the Predil Pass is reached; and starting from thence in the morning, passing on the ascent the pretty Raibl See, and on the descent some of the most stupendous and aweful rocky precipices I have ever seen, we reached Flitsch to sleep, and on the following afternoon emerged from the mountains at Gorizia, not far from the head of the Adriatic, after a long and beautiful drive down the valley of the Isonzo.

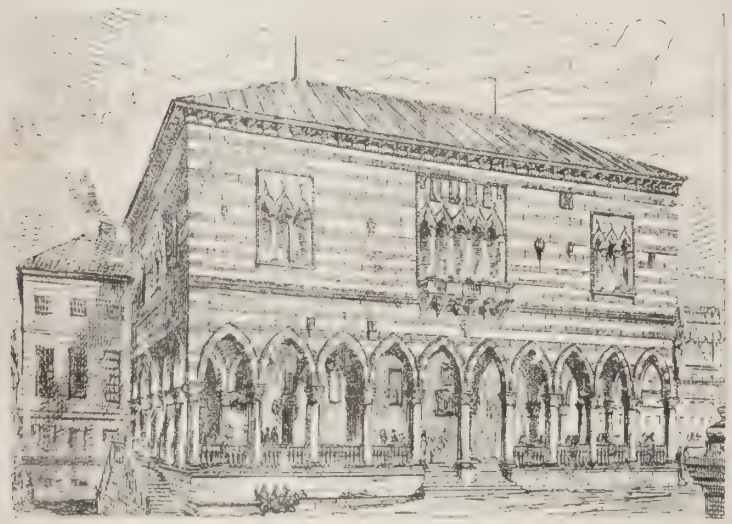
It is a drive of about a couple of hours from Gorizia to Aquileja. The country is perfectly flat, but teeming with vegetation, and it is not until the end of the journey is reached that one realizes under what baleful conditions life or existence is endured here. A Roman capital and a fragment or two of Roman columns or mouldings are all that one sees at first to show that one is driving into one of the greatest of the old Roman seaports. Here, where before its destruction by Attila in A.D. 452 the population is said to have been about a hundred thousand in number, there are now only a few poor houses, and a sparse population, pauperized and invalided by fever and swamps on every side, whilst the sea has retreated some three miles, and left the place to its misery without any of the compensating gains of commerce. Certainly Torcello is a degree more wretched and deserted, but these two old cities have few compeers in misery, and I advise no one but an antiquary to make the pilgrimage to Aquileja, who is not quite prepared to tolerate dirt, misery, and wretchedness with nothing to redeem them.



DUOMO, AQUILEJA.

The one great interest in the city now is the cathedral. This is a great cruciform basilica, with a central and two small apses east of the transept, and eleven arches between the nave and aisles. The arrangements of the apse are interesting; two flights of steps lead up to it from the nave, and in the centre of the east wall is the patriarch's throne of white marble, well raised on a platform above the seat which goes round the apse. The whole arrangement is singularly well preserved, and looks very well in spite of the destruction of most of the mosaic pavement with which originally no doubt the

floor was laid, of which only a few tesseræ now remain, and in spite also of the modernization of the rest of the apse. This throne appeared to me to be not earlier than circa 1150, though the church is said to have been built between 1019 and 1042. These dates must, I think, be taken with large allowance for alterations. With the exception of the apse and the crypt under it, I believe the greater part of the church was rebuilt in the fourteenth century; for though the Roman capitals (which were everywhere ready to the hand) were used on the ancient columns, the arches carried by them are pointed, and the clerestory is evidently of the same age. This combination of Classic columns and sculpture with pointed arches is so very unusual, that it is quite worth while to give an illustration of the interior. The columns, capitals, and bases are of varied shapes and sizes, and evidently a mere collection of old materials which happened to be handy for the builder's use; the arches are rudely moulded, and the clerestory of cinquefoiled windows, each of a single light, is as insignificant as possible, and yet withal there is so grand an area inclosed that the effect is good and impressive. The nave is divided from its aisles by eleven arches on each side, and measures about one hundred and fifty feet in length, by one hundred and five in width. The aisle roofs are modern, but the nave still retains its old roof, a fine example of a cusped ceiling, boarded and panelled



PALAZZO PUBLICO, UDINE.

in small square panels. The whole of this ceiling is painted, and with extremely good effect, though the only colours used are black, white, and brownish yellow. Each panel is filled with a small painted hexagon filled with tracery painted in black and white, and all the ribs and leading lines are yellow and black. The purlines, which are arranged so as to form the points of the cusps, are very decidedly marked with black. Simple as the treatment is, the effect is admirable, and it appeared to me to be owing to the large amount of white in the panels. Near the west end of the north aisle is a singular circular erection, which is said by the cicerone to be the receptacle for the holy oil, but which without this information I should have taken for the baptistery. It is a perfectly plain circular mass of stonework about fifteen feet across, with a doorway on the west side, a moulded base and cornice, and above the latter a series of detached shafts carrying a second cornice of marble. A square projection on the north side abuts against the aisle wall, and seems to have been the special receptacle for the vessel which held the oil. At present it seems to be as little used and understood by the people of Aquileja as it would probably be if it were in some country beyond the Roman pale; a remark by the way on old church arrangements which one finds oneself making almost everywhere, when one contrasts the intentions of the old builders with the uses to which more modern ideas — reformed or deformed, whichever they may be — are in the habit of applying them.

ON THE EFFLORESCENCES ARISING, NOT FROM THE BRICK, BUT FROM THE SALINE SUBSTANCE OF THE ENVIRONMENT, SOIL, MORTAR, ETC.

BY OSCAR GERLACH (PH. D., BERLIN).

IN the preceding parts of this series I endeavored to give some explanation of the manner in which the white efflorescences on clay products are produced during manufacturing, and I found the main sources of the same to be contained in the iron pyrites resident in the clays and in the fuels used, but I considered only the case in which the bricks themselves contained the efflorescing salts. Experience, however, shows that even bricks that come from the kilns perfectly free from such salts subsequently exhibit efflorescence either in the finished building or even after long storage. Before proceeding to the remainder of my discussion, therefore, I will give a brief explanation of this phenomenon, and for the sake of clearness I will distinguish (1) efflorescences which appear during storage, and (2) efflorescences which make their first appearance in the building.

I.

In most brickworks the bricks are stacked in the open places round about the factory; and since these places are commonly very uneven, and often lie lower than the factory itself, they are usually filled in with ashes and broken bricks. But coal ashes contain large quantities of sulphurous materials, as even the uninitiated will understand from what has already been said, if he but reflect that coal ashes usually contain much lime, magnesia, and alkalies, which, on the combustion of the coal and of the sulphur in the pyrites, are converted into sulphuric or sulphurous salts. The fact is that magnesium and calcium sulphates are to be found in considerable quantities in coal ashes. When, therefore, perfect brick are stacked on places filled in with ashes, that part of the salts in the ashes which is dissolved by the rain or the moisture of the ground will penetrate into the lower layer of the porous bricks and will be carried thence gradually from brick to brick until the whole pile is thoroughly saturated with the salty solution. After the evaporation of the water the salts will be left upon the surface of the products.

II.

For the appearance of efflorescence on perfect brick in buildings we have to seek a different cause. Here the mortar is at fault. Many mortars contain alkalies; that is, carbonate of sodium or potassium in small quantities. These are dissolved by the rain, penetrate into the porous brick, and after the evaporation of the water are deposited on the surface, where the evaporation is most energetic. This is very frequently noticeable in buildings where colored mortars are used. The coloring matter oftenest used for the coloration of mortar is oxide of iron, which is mainly prepared by the roasting of iron pyrites. This oxide of iron always contains easily soluble salts of sulphur — principally ferrous sulphate. These sulphuric salts, on coming in contact with the above-mentioned alkalies in the mortar, are converted into sulphuric alkalies, and these in solution are absorbed by the porous bricks and precipitated on the surface. All these salts, which are very readily soluble in water, are easily washed off by the rain, and, on the bricks becoming dry again, are redeposited on the surface. Here a careful analysis of the mortar and coloring matter is necessary.

Frequently the salts contained in the soil on which the building stands are the cause of the efflorescence under consideration. These salts are most commonly produced by the putrefaction of organic, ammoniacal substances,— for example, the urine in cattle and horse stables,— and the efflorescences in question have actually been oftenest noticed in such buildings. By slow putrefaction nitric ammonium is first formed, which, on coming in contact with the lime in the mortar, is converted into nitric calcium, and so gives rise to the well-known "wall-saltpetre," a name by which many brickmakers still characterize all white efflorescences whatsoever on

bricks. Also the environing atmosphere (for the air sometimes contains ammonium) may be the indirect cause of these efflorescences.

With the foregoing the sources of white efflorescences are practically exhausted. I will now speak of the modes of origin of the green and yellow colorations on buildings. These are almost exclusively found on light-colored bricks. They may be either organic or inorganic in character. When organic, they are caused by vegetable micro-organisms, microscopic Algæ, which find their nutriment in the water of the brick, and consequently grow and increase only where their natural element, water, is present, that is, on parts of buildings which are always more or less moist. They impart to the bricks a green or greenish-yellow appearance, similar to the moss-covered rocks of nature; but the Algæ excrescences are infrequent.

More commonly the green colorations are caused by mineral salts. Their characteristic tint renders them particularly noticeable in the case of buildings constructed of white or light-colored bricks. The coloring passes with time gradually from a yellowish green into a dark green, and finally into blue. It is a serious defacement of a structure, and impairs its appearance greatly.

These green efflorescences have been long known and various explanations of their origin have been given; but the interesting researches of Professor Seeger, of Berlin, first shed light upon what seemed to be an inexplicable mystery.[1] Seeger was the first who accurately determined the chemical nature of the green efflorescences caused by mineral salts. They had been thought to be soluble salts of iron, cobalt, and combinations of chromium, but the coloring element had never been determined definitely. In some cases combinations of chromium have really been discovered, and Seeger also found such. But Seeger first determined beyond a possibility of doubt that the majority of the green efflorescences in question were produced by the presence of vanadic acid salts, which are not decomposed by the heat ordinarily maintained in the kiln. Seeger procured large quantities of these saline efflorescences and carefully analyzed them. His analysis yielded the following results:—

Vanadiate of potassium	44.38
Potassium sulphate	9.01
Calcium sulphate	7.97
Magnesium sulphate	10.02
Molybdate of sodium	1.62
Chloride of sodium	4.47
Silicates	3.82
Water	18.25
Insoluble	0.46
	100.00

In addition to the small quantities of molybdate of sodium, it is principally the large quantities of vanadiate of potassium that produce the green efflorescences we are considering. Why this exceedingly rare element should just happen to occur in light-burning clays, and what its combination is in the unburnt clay, has not yet been ascertained. So much only can be said with certainty, that every bright-burning, fire-proof clay belonging to the carboniferous formation contains more or less vanadium. Noteworthy is it that in the green clay this vanadium is not found as a soluble salt. I lixiviated several pounds of green clay with water and diluted acid, and after evaporation sought to determine the vanadium in the solid residuum. I was unsuccessful. The vanadiates seem to be first formed during the burning of the brick. They may be present in the green clay as a metal or oxide.

Further discussion of these green efflorescences will be given later.

In conclusion I would state that the greenish vanadiates, owing to the minimal quantities in which they appear, have no disintegrating effect upon the brick, whereas the white efflorescences impair not only the appearance of the brick, but also injuriously affect their structure and strength, for their capacity for crystallization gradually induces disintegration.

[1] See Seeger: *Gesammelte Schriften*, "*Grüne und gelbe Ausschläge an Verblendsteinen*"; "*Vanadinverbindungen am Brennkohlenthone.*"

Fire-proofing.

SOME NOTES UPON THE STRUGGLE FOR SURVIVAL BETWEEN BURNT-CLAY FIRE-PROOFING AND ITS NEWLY ARISEN RIVALS.

BY DANKMAR ADLER.

IN the development of industrial, and even in scientific progress, men have always shown a tendency to make an occasional halt in their onward march, and at such times to treat partly developed theories as finalities, and to ignore propositions which, after but another forward step or another forward glance, would have been recognized as axioms. In the light of subsequent discoveries these halts seem to have been altogether unaccountable, while still greater marvel attaches to the tenacity with which otherwise enlightened and progressive men frequently adhere to the positions taken at these times of arrested development. After the forward movement has been again taken up it seems quite incredible that a fetish worship should have been accorded by enlightened beings to crude and half-developed theories, and to the still cruder incorporations of these crude theories into active practise; and it seems still more strange to note the mechanical paradox of an apparent increase of inertia which seems to be in direct proportion to the length of time consumed in any one of these halts. At such times the progressive energy which until then made for continuous movement toward betterment of practise seems to be converted into tenacious adhesiveness to the attained position, and all capacity for carrying out or even entertaining a forward impulse seems to be lost.

In the development of the science and art of fire-retardent construction we have successfully passed one such halting place only to have arrived at another, upon which the forces which originated and developed the known processes of burnt-clay fire-protective covering are resting in placid contentment with the progress attained, reluctant to attempt farther flights into the realm of attainable approach to perfection, and scornful of those who attempt such approach by the aid of other means than those which the tile-maker has already contributed.

For many years after the first appearance in building practise of iron pillars and beams it was believed that a building could be made really "fire-proof" by substituting iron pillars and beams and brick arches for wooden posts, girders, joists, and floors. Disastrous fires at London, Hamburg, Berlin, New York, and Chicago demonstrated the untenability of that assumption. Among the facts brought out by these fires were, first, that combustible chattels and furnishings placed within an incombustible structure still retain their combustibility, and may, if stored in sufficient quantities, be kindled and fanned into an exceedingly hot and fierce blaze; second, that iron, though incombustible, is not indestructible by fire, and that its deterioration under the effects of a hot fire causes results quite as disastrous as would be the burning of wooden structural members supporting the blazing combustible contents of the building of which they are part.

It seemed, then, in all cases where there were conditions which precluded the use of brick or stone piers and vaultings, to be Hobson's choice between the use of wooden structural members which add fuel to the flames of burning contents of buildings, and that of metallic structural members which expand, soften, and collapse under the effects of the heat of burning goods and chattels surrounding them; for in either case the destruction of a building appeared to be a foregone conclusion, if but a fire once obtained a good headway among its contents.

This led thinking and progressive constructors to conceive the idea of completely encasing the structural members of a building with substances at once slow to conduct heat and incapable of destruction or even serious injury by fire.

Almost from the very beginning burnt clay in various forms became the preferred encasing material. It was easy to mold it into the required shapes; it could be made light of weight in the course of its manufacture; it had been exposed to higher temperatures than those of a blazing building; it could be applied by ordinary building artisans at moderate cost and in all weathers. For these and other reasons it took and held possession of the field for many years with but little molestation.

It finally came to be believed that if only burnt clay were used to some extent as an essential part of a "system" of alleged "fire-proof" construction, building and contents were certainly secure against destruction and probably safe from serious injury by fire. But now this belief is assailed by reports of the damage suffered in the course of fierce and long-continued fires by buildings in which burnt clay had been used as fire-proofing material, and still more by fierce and persistent attacks upon burnt clay made by the advocates of other, more recently invented "systems" of "fire-proof" construction, which are so new as not to have had the opportunities of subjection to test in actual conflagrations which have fallen to the lot of older methods.

This tendency toward an anti-burnt-clay heresy may be fought in either of two manners. The first, peculiar to the state of halting and rest upon the road to perfection, is to fall back upon the incontrovertible statement that clay tiles of all kinds, having once been subjected to furnace heat, are indestructible by fire; that the present methods of manufacture and application of clay fire-proofing materials, being sanctioned by nearly a quarter century of practise and experience of manufacture and application, have achieved a status like that of the Thirty-nine Articles or Magna Charta or the Constitution, an attempt to alter which is synonymous with sacrilege, heresy, and treason; and that if there are observed facts which show that there may be buildings so constructed that the burnt clay used in them fails of making them fire-proof, why, then so much the worse for the facts. Fortify this position with a circumvallation built up of desires to save innumerable obsolete, rusty, rickety manufacturing plants, which have earned their first cost over and over again, but which are carried on manufacturers' inventories at their first cost together with all repairs and tinkerings since their first origin upon the plain of Shinar, and the champions of burnt-clay fire-proofing processes may make a defense as stubborn as that of Thermopylæ, but their cause will be lost and their territory overrun and despoiled by the enemy.

There is another, less sentimental and less romantic, way of facing the attack and of reestablishing and maintaining the claim that burnt clay is in most instances the most reliable material that can be used as a fire-protective covering of the structural members of buildings. In organizing and marshaling the forces of the burnt-clay industries in the offensive-defensive warfare which its friends must wage until their former position is reconquered, there is no room for maudlin, self-laudatory memories of the bloodless victories won in the past, of the hundreds of buildings, the square miles of floors, the hundred thousands of pillars and beams in and upon which burnt clay has been used as a fire-proofing material in the days when none other had been thought of; nor is it allowable to consider tenderly and reverentially the perpetuation of the plans and plants, the machines and dies, the processes and instruments by means of which the burnt-clay fire-proofing industry was established and maintained before its wicked and unscrupulous enemies had had the temerity of proposing the substitution of materials and processes wrongfully, of course, but yet plausibly, vigorously, and persistently vaunted as superior to burnt clay in its every shape. Nothing should be thought of but the aim to so profit by the lessons of the past as to eliminate from burnt-clay fire-proofing practise every imperfection developed by experience and incorporate in it every improvement suggested by thoughtful ingenuity and aggressive enterprise.

As the battle stands now, the age and general adoption and application of the various processes of burnt-clay fire-proof construction have become an element of weakness, while the apparent strength of other systems and processes appears to lie chiefly in their novelty and in the comparatively limited range of their practical application to actual building operations. The number of instances in which the former have been exposed to the destructive efforts of fire is necessarily much greater, and therefore, also, the number of opportunities for showing the existence of weakness and imperfection, than can in the nature of things be the case with the more recently developed systems, whose champions, however, are quick to observe and expose every tendency to failure under stress of actual use of the older material, the reputation of which they aim to destroy.

If those interested in the maintenance of the not yet altogether destroyed preference for burnt clay as a fire-proofing material will read and learn the lessons taught by the exposure of their material to fire under varying conditions and methods of attack, it will give them a great advantage over their newly arisen rivals, whose materials and processes will, ere long, begin to show in the light of subjection to actual conflagrations many shortcomings and failures to attain ideal perfection, as is the lot of all that is created by the spirit and the hand of man. By the time the conduct under fire of the newer materials and processes will have begun to amaze and horrify their friends, there will have been many corrections of defects which the experience of years will have shown, and which the criticism of rivals and enemies will have pointed out as latent in burnt-clay fire-proof construction, and this industry will have been established on a firmer footing than ever before.

But before the arrival of that day there will be many exasperating experiences. There are dozens of buildings, particularly in New York, in which hollow-tile arches have been used for floor construction, in which pillars, girders, and beams have been left exposed in whole or in part. There are scores of buildings throughout this country in which the burnt-clay coverings of bottom flanges of beams, or the enclosures of pillars are inadequate, and fully as many in which the integrity of the fire-protective covering of important structural members has been seriously impaired by the manner in which wooden grounds, and blocks, and conduits, and insulators made of highly inflammable materials have been applied and introduced. There are altogether too many instances of acres of floor space supported by burnt-clay protected pillars and beams, but covered by inflammable fixtures and chattels, and enclosed chiefly by sheets of glass in wooden frames, unprotected by shutters and exposed to attack by fire from without. There cannot help but be many more cases of serious injury to the fire-protective covering of such structures, and these will be considered as condemnatory of the material burnt clay and not of the manner in which it is applied, unless the friends of burnt clay begin to combat erroneous and injudicious use and application of their materials even more earnestly and vigorously than they may fight the efforts to substitute other materials and processes for their own.

It is, therefore, essential that thoroughgoing study be made of the damage which the ordeal of fire has inflicted upon clay fire-proofing materials, of the causes of such damage, and of the means by which it be prevented in the future. Of the injuries noted, some were due to the introduction, as in the building of the Chicago Athletic Association, of wooden strips between the individual blocks of hollow tile; others, to absence of protection upon important structural members, as was the case in the Western Union Building of New York; or, again, as in the Horne Building, at Pittsburg, the harm suffered seems to have been due to an effort apparently made to combine a maximum of exposure to attack of fire from without, with a maximum aggregation of combustible material within the building, and the opposition to this of a protective covering of burnt clay barely sufficient to meet the minimum of fire danger characteristic of the ordinary office building. That the Horne Building remained, for the most part, structurally intact is, therefore, in itself a victory for burnt clay, even if the general design of this building intended to be "fire-proof" was a disgrace to its author.

(*Continued.*)

The Masons' Department.

CERTAIN RIGHTS OF THE CONTRACTOR.

THE average building contractor is so accustomed to look out for himself, and, we must admit, is so perfectly able to do so, that we do not always bear in mind some of the rights which are undoubtedly his, but which are very often not insisted upon; and the scramble for work, especially in these dull times, is so pronounced that we imagine an architect can easily fail to appreciate how much it means for a contractor to be spending his time week after week figuring new work, none of which may come his way. There have been at different times a few spasmodic attempts to so alter the present system for making tenders for work that there would be an opportunity for some compensation to be awarded to unsuccessful bidders. At one time it was proposed that each of the contractors who were invited to figure should add a certain percentage to his bid, the one to whom the contract is awarded to divide this percentage among the unsuccessful contestants. One of the strongest of the trade associations in this city has, if we are rightly informed, carried such a scheme into practical effect for a number of years with eminently satisfactory results. But as this particular association limits its work to a technical portion of building operations and includes in its ranks practically all who follow this line in this city, it is easier to regulate such a practise than it would be in the case of the general contractors, who often have to compete with every one, and on all sorts of terms and conditions. It would really be fair that when a contractor is called upon to spend several days in carefully estimating the cost of a structure, the owner, who thereby gets the benefit of selection from several bidders, should be willing to pay a small compensation for the opportunity, though just how this can be brought about is a question which is not easily solved. There are a few considerations, however, that would certainly lighten the task of the unsuccessful bidder, without laying any serious burden upon either architects or owners.

It ought to be an inflexible rule with an architect that no contractor should ever be allowed to change his bid after it has once been submitted in writing. If the builder is to feel that the owner, by applying moral suasion, can expect him to cut off five, ten, or fifteen per cent., he will, if he is human, add that amount to his bid in the first place, and take his chances on being the lowest, and it is believed that by adhering strictly to a rule of this sort the architect would get lower bids in the first place, and would take a higher rank in the opinion of the competitors.

Another slight act of courtesy can make relations much more pleasant. Ordinarily when a builder submits a tender for work he thereupon goes his way and may not know for weeks, or even months, who is to do the work. Just as soon as any decision is reached, each one of the bidders ought to be notified that the contract has been awarded to so and so under certain conditions, and appreciation expressed of the services of the bidder in figuring. This is not money compensation for estimating, but it is a matter of courtesy between the architect and the builder, which one owes to the other. The architect cannot build a building without a builder, though the builder might put up a structure without an architect, but anything which brings the two more closely together is of unquestionable advantage. The line between architect and builder is at best a faint one, and the amenities of civilization can well be studied as a branch of architecture.

STRENGTH OF CONCRETE.

A SUBSCRIBER submits the following query to THE BRICKBUILDER for an answer: "Will you kindly inform me through your journal as to the bearing strength of concrete, or the proportionate thickness to the width?"

This query is somewhat indefinite in form, and it must be answered as two separate propositions, one as to the compressive strength of concrete, and the other as to the necessary proportion of width to thickness.

Some recent tests of the strength of concretes, prepared from different cements and aggregates, have been conducted by the Engineer Department of the District of Columbia, and the results are published in the Report of the Operations of this Department for the year ending June 30, 1897, and may be found in full on p. 165 of that report. A synopsis of these results is given in the following table: —

TABLE G.

No.	Composition of Concretes, by Volume	10 days.	45 days.	3 mos.	6 mos.	1 year.
	1 PART NATURAL CEMENT, 2 PARTS SAND.	Pounds.	Pounds.	Pounds.	Pounds.	Pounds.
1	6 parts average concrete stone	32,900	77,687	54,022	114,412	131,700
2	3 parts average concrete stone, 3 parts gravel	15,500	52,362	85,315	90,965	121,100
3	4 parts average concrete stone, 2 parts gravel					131,700
4	6 parts (¾ average concrete stone, ¼ granolithic)					115,200
5	6 parts average gravel	12,500	60,652	51,980	49,437	109,900
6	6 parts coarse concrete stone (no fine)			85,880		119,300
	1 PART (ATLAS) PORTLAND CEMENT, 2 PARTS SAND.					
7	6 parts average concrete stone	130,750	[1]343,520 172,325	324,875	361,600	440,040
8	3 parts average concrete stone, 3 parts gravel	136,750	266,962		298,037	396,200
9	4 parts average concrete stone, 2 parts gravel					408,300
10	6 parts (¾ average concrete stone, ¼ granolithic)					388,700
11	6 parts average gravel	99,900	234,475	385,612	265,550	406,700
12	6 parts coarse concrete stone (no fine)			234,475	220,350	266,300

Additional information is also contained in Baker's *Treatise on Masonry Construction*, p. 109, from which it appears that hydraulic concrete, made in various ways with natural cement, may have a compressive strength of from 65 to 85 tons per square foot in cubes at an age of six months, and with Portland cement a strength of from 144 to 219 tons, results which do not differ largely from those obtained in Washington.

The necessary relation of thickness to width of any concrete mass cannot be fixed by any general rule, but is dependent upon the particular conditions under which the concrete is used. If the concrete is to form the footing for the support of a wall or pier, the relation of thickness to width will depend upon the nature of the soil or foundation upon which the concrete is laid and the amount of load that it is to carry. Each particular case must, therefore, be considered by itself. For piers for the support of heavy machinery the concrete may be several times thicker than wide, whereas, as a base for pavements, it may be made many times wider than thick. For any particular case the relation can be determined from the strength of various concretes previously given.

LIMESTONE IN CONCRETE INJURIOUS TO IRON?

AT the last meeting of the American Society of Civil Engineers, Mr. L. L. Buck stated, as reported in our last issue, that limestone in concrete, applied to iron or steel surfaces, would certainly cause deep corrosion of the metal wherever the stone came in contact with the metal. In the anchorages of the Niagara railroad suspension bridge, the strands of the main cables were imbedded in a concrete made with limestone, and wherever the spalls touched the wires the latter were badly eaten and sometimes entirely severed.

This is a matter of such importance that it deserves careful attention, particularly in view of the use of limestone in concrete laid in connection with the structural metal work of large buildings, where corrosion can be detected only with much difficulty. There is a wide variation in limestones, and it may be that some grades will act corrosively and others not; it is desirable that this point should be borne in mind in discussing the subject. — *Eng. Record.*

[1] There being such a great difference in the crushing of the two cubes, the strength of each cube, and not the average, is given.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.— There seems to be an impression in all parts of the country that business in New York is entirely suspended and that the greatest uneasiness and excitement prevails. Such, however, is not the case, and it is really surprising, in view of existing circumstances, that everything is running along so smoothly. There is naturally some excitement and business is "quiet," but not suspended by any means. The exchanges are very active in buying and selling and a healthy tone prevails. Of course, most large building enterprises are being temporarily postponed, but owing to recent encouraging reports and the prospects of an early cessation of hostilities it cannot be for long. The work on smaller buildings and residences seems to be progressing favorably.



BRACKET IN MAIN CORNICE. CHAMBER OF COMMERCE BUILDING, CLEVELAND, OHIO.
Executed by the Northwestern Terra-Cotta Company.
Peabody & Stearns, Architects.

A great source of annoyance at the present time is a strike among the stone-cutters which has been in force for several weeks. It has almost caused a cessation of work on the great thirty-story Ivins Syndicate Building, on Park Row, which it is intended to have ready for occupancy in September.

The National Sculpture Society is now holding its third annual exhibition in the Fine Arts Society Building, 215 West 57th Street. This is by far the most ambitious exhibition which the society has yet attempted, and should be of great interest to the general public as well as to architects and sculptors. The growing friendliness and cooperation between architects and sculptors is very gratifying and gives promise of future works in which the two arts will be jointly represented, each enhancing the beauty of the other. Among the few important items of news among architects may be mentioned: —

Plans have been prepared by York & Sawyer, architects, for a new building for the Franklin Savings Bank to be erected at 658 Eighth Avenue. The building will be of brick and stone, and will cost $200,000.

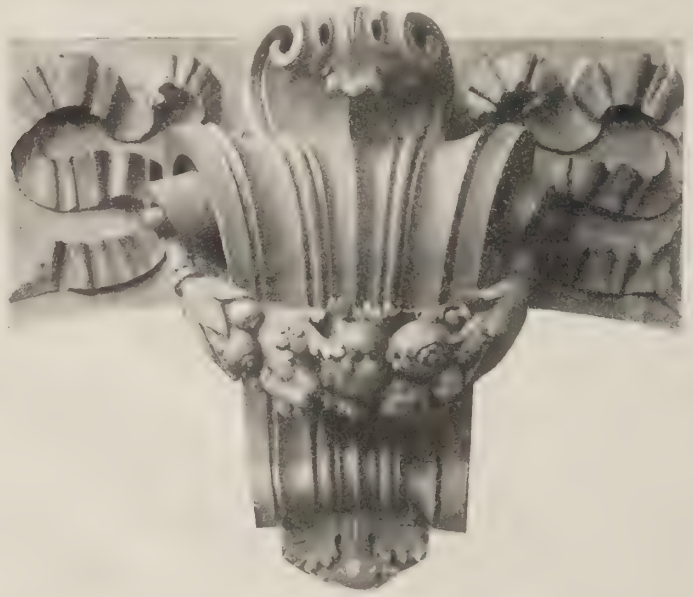
Ludlow & Valentine, architects, have prepared plans for a five-story brick and stone store and office building to be erected on East Ninth Street; cost, $200,000.

Edward H. Kendall, architect, has planned an eight-story brick and stone office and printing house for the Methodist Book Concern.

N. C. Mellen, architect, has planned a four-story brick and stone dwelling to be erected on Madison Avenue; cost, $130,000.

Cleverdon & Putzel, architects, have prepared plans for four five-story brick dwellings to be erected on 76th Street, at a total cost of $160,000.

Carrere & Hastings, architects, have planned a five-story



DETAIL, NEW YORK AND NEW JERSEY TELEPHONE BUILDING, BROOKLYN, N. Y.
Executed by the Perth Amboy Terra-Cotta Company.
R. L. Daus, Architect.

brick and stone dwelling to be erected on Fifth Avenue, near 72d Street.

Dehli & Chamberlain, architects, have planned a new building for the Church of the Good Shepherd, Brooklyn. It will be a brick and stone structure and will cost about $40,000.

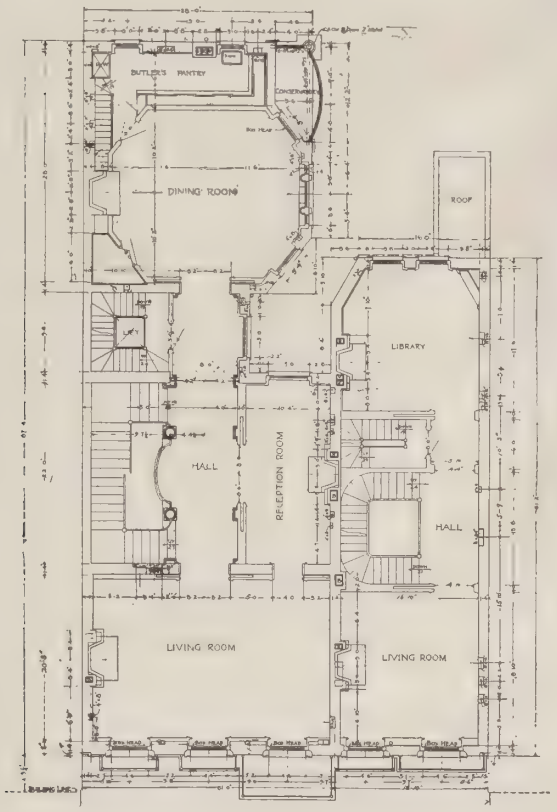
CHICAGO.— The writer knows of a building enterprise in New York which, a few months ago, could have obtained on its exceptional security a loan of $30,000 at 4½ per cent. Now, however, operations are suspended until the money market can determine its own emotions on the war with Spain. Similar conditions prevail in Chicago. Recently a loan at 4½ per cent. was announced on property located, it was noted, outside of the business center of the city. Not long afterward a better loan on property in the heart of the business district was held up at 6 per cent. As this indicates, many building projects are awaiting the outcome of the war.

About a year ago the Chicago Architectural Club gave up its club house and moved into the Art Institute Building. They and the Caxton Club (an organization of book cover connoisseurs) were the first to take advantage of the new policy of the Art Institute, to gather within its walls a group of clubs interested in art. Now the Illinois Chapter of the Institute of Architects has done likewise, and without any cost save the taking out of membership tickets in the



CAPITAL FOR OFFICE BUILDING, HOLYOKE, MASS.
Executed by the Standard Terra-Cotta Company.
Clough & Reid, Architects.

Art Institute for each member of the Chapter. It possesses headquarters in our temple of art, which, with its art school of twelve hundred, its fine galleries of painting and sculpture, its school of architecture, and close affiliation with the Armour Institute of Technology, and, finally, its group of art clubs, ought certainly to be the center of a strong art influence in the West.



FIRST FLOOR PLAN.

HOUSES FOR JAMES J. GOODWIN, ESQ., 54TH STREET, NEW YORK.
McKim, Mead & White, Architects.
Elevation shown on plate 34.

In the line of building news there is not much at present concerning tall office buildings. One fourteen-story building, 50 by 68, is to be erected on the site of a building recently burned.

Holabird & Roche have a business building 100 by 100, two stories high, "chiefly glass." Some important manufacturing plants are in the prospective stage. Wilson & Marshall have in hand extensive alterations to Hooley's Theatre. The question of a new court house is being agitated again. Some new public schools and city pumping stations are projected. The showing of the building operations for April is less, based on the permits, than for the previous month, or for the corresponding month last year.

Active measures are being taken by the Central Art Association, in behalf of the trans-Mississippi Exposition, "to erect, furnish, and decorate a modern $10,000 house containing ten rooms, wherein will be used the most approved building material of the present time. The following committee of architects, Geo. R. Dean, Frank L. Wright, and R. C. Spencer, Jr., has been selected by the Central Art Association to design a home which may be considered typical of American architecture." It is to be hoped that this project will be successful in every way, and that material dealers will contribute generously to make it so.

Apropos of a scandal referred to last month concerning an improperly constructed building which recently burned, it is interesting to note that the new city building ordinances hold architects responsible thus: "Any architect having charge of such building, who shall permit it to be constructed in violation of this ordinance, shall be liable to the penalties herein provided and imposed." However much architects may be overridden in matters of taste, they should be held fully responsible as professional men in matters of construction.

PITTSBURGH.—After the general complaint of the scarcity of work which has come from architects and contractors so far this year it is rather surprising to learn at the office of the building inspector that during February, March, and April three hundred and fifty-seven permits have been issued against three hundred and seventy-nine during the same period of last year, while the valuation of the work of this year has been nearly half again as much as that of the same period of 1897.

The first exhibition of the Pittsburgh Chapter of the American Institute of Architects was opened at the Carnegie Art Galleries on Saturday evening, April 30, by a reception to members and friends. The exhibit is a most excellent one and comprises most of the best drawings seen in New York, Philadelphia, and Chicago this year. Its general excellence is not due, however, as one of our daily papers would have us believe, to the large size of the drawings; this paper remarks that it is very impressive, "many of the drawings being quite large, many as large as 8 by 2 ft.!" Everything is being done to have the exhibition visited by the public, as it may be made an important factor in the education of the architectural taste and criticism of the community. Among some of the most attractive drawings may be mentioned Cope & Stewardson's drawings for the Pennsylvania Institute of the Blind; the designs for the National Academy of Design Buildings, by Babb, Cook & Willard; the drawings of the Mt. Aloysius Academy at Cusson, Pa., by Alden & Harlow; the interiors by Nicola d'Ascenzo; and the exhibits from the Massachusetts Institute of Technology and the University of Pennsylvania. There are also many attractive sketches, notably those of Frank A. Hays, the pencil sketches by H. A. Woodbury, a charming sketch of a suburban residence by Howard Shaw, and the pen and ink drawings of Joseph Pennell. There are also shown the drawings received in the competition lately given by the Pittsburgh Chapter for an entrance to Schenley Park. The prize, $500, to be expended in a year at some architectural school, was awarded to C. C. Mueller.

The opening exercises were also made the occasion of the unveiling of a life-sized bronze bust of the late J. D. Bernd, a prominent merchant of Pittsburgh, who left the Carnegie Library some $20,000 to be expended on architectural books.



CAPITAL SPINGLER BUILDING, NEW YORK CITY.
Executed in gray terra-cotta by the Excelsior Terra-Cotta Company.
W. H. Hume & Son, Architects.

Among buildings now in process of construction or soon to be commenced may be mentioned the new department store for Kaufmann Brothers, to be built of brick and terra-cotta, Charles Beckel,



MAIN ENTRANCE, CITY HALL, PATERSON, N. J.
Showing Guastavino system ceiling.
Carrere & Hastings, Architects.

architect; the First United Presbyterian Church, to be built in Oakland, Thomas Boyd, architect; the large new Mother House for the Sisters of the Third Order of St. Francis, of brick and stone,



TERRA-COTTA DETAIL, HARTFORD TIMES BUILDING, HARTFORD, CONN.
Executed by the Conkling, Armstrong Terra-Cotta Company.
A. W. Scoville, Architect.

S. F. Heckert, architect. Mowbray & Uffinger, of New York, have made plans for the new East End Bank, to be built of white marble, cost about $70,000. Alden & Harlow have recently let the contract for a Carnegie Branch Library and are at work on two more, one to be built on Wylie Avenue and the other on the South Side, estimated cost of each about $30,000.

D. H. Burnham, of Chicago, was awarded the first place in the competition for the Union Trust Company Building, and is at work on the drawings. The same architect is also preparing plans for a new Union Station for the Pennsylvania Railroad, to cost $500,000.

HAVING illustrated from time to time in our other pages various interesting problems in the Guastavino system of cohesive construction, large domes, floors for heavy loads, roofs, etc., it is a pleasure to note the increasing tendency in this strictly masonry system towards architectural and artistic effect in the construction itself. By means of improved material there has been a continuous advance along this line of making the masonry its own decoration, and we can see some of its capacities in the vestibule ceiling of the main entrance of Paterson City Hall, Carrere & Hastings, architects, illustrated herewith.

CURRENT ITEMS OF INTEREST.

ST. LOUIS SEWER PIPE MANUFACTURERS have been figuring on three hundred car loads of sewer pipe for Guadalajara, Mexico; also a large contract for city of Mexico.

DYCKERHOFF PORTLAND CEMENT was used to cover the Assabet Bridge, at Northboro, Mass., built by the Metropolitan Water Board. The bridge is 329 ft. long by 189 ft. wide.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY are supplying the terra-cotta for twelve houses for F. A. Potter & Son, at Philadelphia, H. E. Flower, architect.

THE BERLIN IRON BRIDGE COMPANY have just completed for the Conway Electric Street Railway Company, at Conway, Mass., a steel bridge 300 ft. in length, to carry their electric line across the Deerfield River.

WALDO BROTHERS are furnishing the face bricks for a residence front at Worcester, Mass., L. E. Gironard, contractor. These bricks are manufactured by the Ohio Mining and Manufacturing Company, Shawnee, Ohio.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., have just completed a fire-proof boiler house for the Hendey Machine Company, of Torrington, Conn.; also a new fire-proof casting shop for the Whitin Machine Company, of Whitinsville, Mass.

THE contract for the Lincoln Trust Building, 7th and Chestnut Streets, St. Louis, has been let to McArthur Brothers, of Chicago, D. H. Burnham, Chicago, architect; cost about $400,000. Face bricks are called for.

WALDO BROTHERS report that they are supplying Atlas Portland cement for municipal work in the following cities: Boston, Providence, Worcester, Haverhill, Quincy, Somerville, Brookline, Everett, Melrose, Malden, and Medford.

THE lining of the easterly walls of the Scollay Square station

of the Boston Subway has been awarded to the Grueby Faience Company. This makes the fourth station of the Subway in which their goods have been used.

The American Enameled Brick and Tile Company will supply, through their New York agents, Meeker, Carter, Booraem & Co., the enameled brick and glazed terra-cotta in the new Post-Office building at Paterson, N. J., McIlvaine, Unkefer & Co., builders.

The Standard Terra-Cotta Company are supplying the architectural terra-cotta for the Press Building, Philadelphia, T. P. Chandler, architect; also for the new building for the Union Gas Company, at Point Breeze, Philadelphia, Wilson Brothers & Co., architects.

The Winkle Terra-Cotta Company is furnishing the terra-cotta work for interior and exterior of Ohio, Minneapolis & St. Paul Railway Station, Minneapolis, Minn., Charles S. Frost, architect. They are also making terra-cotta for Lincoln Trust Building, St. Louis, Eames & Young, architects; George A. Fuller Company, contractors.

Meiers Puzzolan Cement (Waldo Brothers, New England agents) is being used in the Somerset Hotel, Commonwealth Avenue, Boston, A. H. Bowditch, architect; and in the Westminster Hotel, Copley Square, Boston, Henry E. Cregier, architect. This cement is also specified for the light stone work on Back Bay Station of the N. Y., N. H. & H. R. R.

The Brick, Terra-Cotta, and Supply Company, M. E. Gregory, proprietor, Corning, N. Y., have closed contract for the brick and terra-cotta required for Mrs. S. L. Gillett's residence, Elmira, N. Y., Pierce & Bickford, architects. They also have contract for the terra-cotta required for Parochial School, Elmira, N. Y., J. H. Considine, architect.

The Boston Fire-proofing Company are fire-proofing the following new buildings in Boston: Store building, corner Bedford and Chauncy Streets, Winslow & Wetherell, architects; George A. Fuller Company, contractors; building for the Boston Electric Light Company, Whidden & Co., contractors; American Express Company's new building, Prescott & Sidebottom, architects; L. P. Soule & Son, builders.

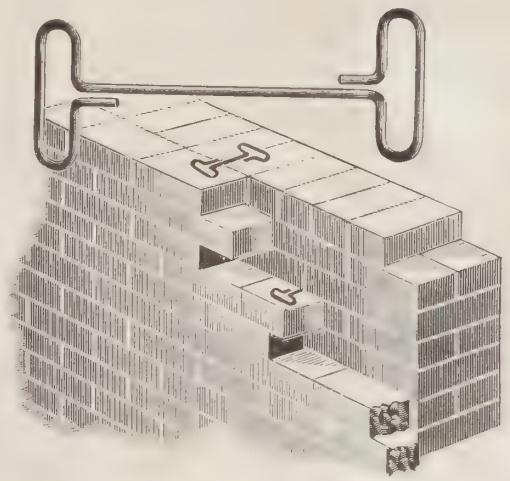
Among the new buildings recently supplied with brick by the Columbus Brick and Terra-Cotta Company are: Stores and apartment house for George H. Matchett, at Cleveland, Ohio, Robert Crabb, architect; theater and music hall at South Bend, Ind., Dirham & Schneider, architects; new high school building at Columbus, Ohio, D. Riebel, architect; and residence at Columbus, Ohio, for W. Y. Miles, J. E. Elliot, architect.

The following buildings have just been equipped with the "Bolles Revolving and Safety Sash": New York and New Jersey Telephone Building, Brooklyn, N. Y.; New York Telephone Building, 15 Dey Street, New York City; New York Telephone Building, 18 Cortlandt Street, New York City; Cushman Building, Broadway, New York City. The sash for the tallest office building in the world (Park Row Syndicate Building) is now being fitted with the Bolles fixtures.

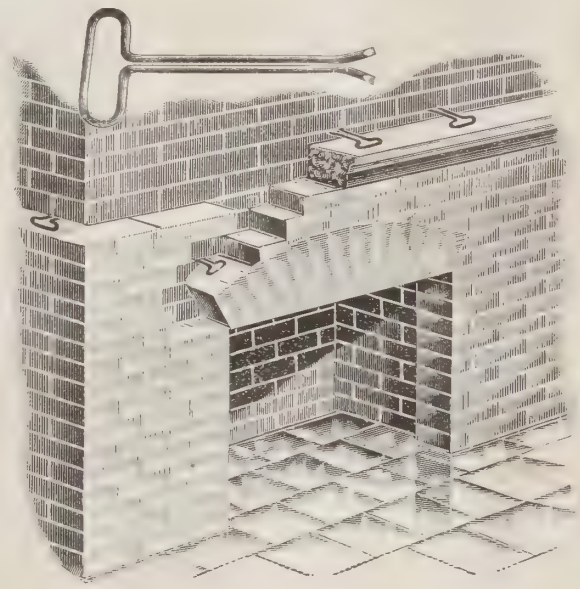
The Standard Terra-Cotta Company, through their New England agents, O. W. Peterson & Co., have recently secured contracts to furnish the terra-cotta for the following buildings: The Science Building, Springfield, Mass., Gardner, Pyne & Gardner, architects; a business block at Holyoke, Mass., Clough & Reid, architects; Taylor's Theater, Worcester, Mass., Fuller, Delano & Frost, architects; Thomas Barrett, builder; Wilder and Moore Halls, Dartmouth College, Lamb & Rich, architects.

The Queen Sash Balance Company, of 150 Nassau Street, New York City, whose overhead window pulleys have gained a world-wide reputation, are finding great success in placing on the market an improved window stop adjuster which they have just patented. The adjuster consists of a small bronze cup with a corrugated base having an oblong opening, and a corrugated washer to fit the corrugated base, which allows a screw to pass through it and thus holds the stop bead absolutely rigid. Samples and catalogue will be furnished upon application.

The Cleveland Wire Spring Company, of Cleveland, Ohio, are placing upon the market a line of patented steel wall ties



for bonding pressed or enameled brick facings, hollow walls, terra-cotta blocks, etc., which will, we believe, find favor among architects and builders as being practical and valuable. The claim is made that, being perfectly flat and the formation such, — without spring, — they form a direct lock that bonds perfectly. The accompanying illustrations give a good idea of the exact manner in



which these ties are used. The same company has also an improved wire snow guard for slate and shingle roofs. Catalogues which include price-list will be sent on application.

Vessels of the United States Navy are being equipped with the Mason Safety Tread, the Department having approved of this

material as being well adapted to secure protection to the sailors under conditions where, to the ordinary danger of slippery treads, is added the instability caused by rough seas and constant motion. Among the vessels for which orders have been given for entire or partial equipment with Mason Treads are, the *Brooklyn*, *Iowa*, *Indiana*, *Minneapolis*, *Columbia*, *Kearsarge*, *Kentucky*, *Bancroft*, *Lancaster*, *Lebanon*, and *Southery*. Mason Treads prevent wear and slipping whether on land or sea.

The Dagus Clay Manufacturing Company shipped upwards of five hundred thousand bricks during the month of March. Among contracts recently closed is a residence for George B. Ensworth, Warren, Pa., C. M. Marston, architect; to be built of dark buff with dark pink trimmings; residences for William V. Eisenberger, Lancaster, Pa., and G. L. Lawrence, New York City, Dagus fire-flashed Pompeian tile; a building of light buff brick for John Westenberger, Lancaster, Pa. They are working upon an order of mottled pink for John W. Reith, Lancaster, Pa. They also furnished dark gray brick for a barn for Dr. John A. Ritchie, Oil City, Pa., and have delivered to the B. N. McCoy Glass Works one hundred and fifty thousand light buff brick for an addition to their factory building at Kane, Pa.; also forty-seven thousand dark red front brick for Thomas W. Poy, Kane, Pa. They report the season as having opened fairly well with prospects of continued trade excellent.

J. B. Colt & Co., who for many years were located on Nassau Street, near Ann Street, New York City, removed May 1 to Nos. 3, 5, and 7 West 29th Street, corner of Fifth Avenue, where they have considerably more room than heretofore, in a very much better neighborhood, and with very much better facilities of all kinds.

It is the leading firm of the United States engaged in the manufacture and sale, at wholesale and retail, of educational and scientific projection apparatus, electric focusing lamps, etc.

Since acetylene gas became a factor in illuminating work, Messrs. Colt & Co. have made a special feature of acetylene generators, and for such appliances they are now recognized as headquarters. They have very completely equipped acetylene gas show rooms at 125 West 37th Street, corner of Broadway, where the capabilities of the new illuminant are being fully set forth to a multitude of visitors every day.

The business of the house was originally founded in 1870 by Mr. James Bennett Colt, the present senior partner. In 1888 Mr. Charles Goodyear became a partner, and these two gentlemen constitute the present firm. The firm has branches in Chicago and San Francisco, and its business extends literally to all parts of the country.

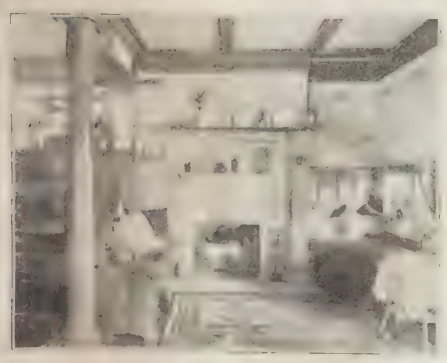
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Also a small FACTORY, equipped for making roofing tiles and bricks.

Apply to Curtis Creek M. F. & M. Co., 12 St. Paul Street, Baltimore, Md.







Fireplace Mantels.



The best ones to buy are those we make of Ornamental Brick. There's nothing else as good or as durable. Our mantels don't cost any more than other kinds, and are far better in every way—our customers say so. Don't order a mantel before you have learned about ours. Send for our Sketch Book showing 53 designs of mantels costing from $12 upwards.

Phila. & Boston Face Brick Co.,
15 LIBERTY SQ., BOSTON, MASS.





WORKS OF THE CELADON TERRA-COTTA CO., LTD., AT ALFRED, N. Y., IN 1888.

Charles T. Harris, President.
Henry S. Harris, Vice Pres.
Will R. Clarke, Sec. and Tres.
Alvord B. Clarke, Superintendent.

Main Office and Factory,
ALFRED, N. Y.
ESTABLISHED 1888.

Eastern Office, New York,
Room 1123, 156 Fifth Ave.
Western Office, Chicago,
Room 1001, 204 Dearborn St.

...Announcement...

At a meeting of the Stockholders of the Celadon Terra-Cotta Co., Ltd., held at Alfred, N. Y., on the 10th day of May, the lease held by Charles T. Harris for a term of years on the plant, property, patents, and equipment of the Company was terminated by mutual consent. The business will be carried on hereafter by the Company under the management of the officers named above.

All the different interests having been centered as indicated in the present management, it is hoped that the good will and patronage given so liberally to the Lessee will be equally extended to the Company, which is now in a position to serve the roofing tile interests of the country better than ever before. All contracts and guarantees entered into by the Lessee will be carried out by the Company, to whom all communications and billings should hereafter be addressed.

June 1, 1898.

The CELADON TERRA-COTTA CO., Ltd.
CHARLES T. HARRIS, Lessee.



THE CELADON TERRA-COTTA COMPANY'S WORKS IN 1898.



THE DELMONICO BUILDING, 44TH STREET AND FIFTH AVE., NEW YORK CITY.
JAMES BROWN LORD, ARCHITECT.

TERRA-COTTA AND BRICK BY THE

NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY,

PHILADELPHIA. 38 PARK ROW, NEW YORK CITY. BOSTON.

VOLVME VII JUNE 1898 No. 6

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

ROGERS & MANSON,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX 3282.

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EXTENSION OF BOSTON FIRE LIMITS.

THE city of Boston has been on the whole quite fortunate in regard to its building ordinances; which, with very few exceptions have been drawn up under expert advice, and in some cases were directly prepared by some of the best architects and builders in the city. Alterations of these ordinances have in general been pretty carefully considered by experts before being presented to the legislature; but opposition which such well-considered improvements of existing laws invariably encounter at the hands of politicians and selfish property owners is of course not peculiar to Boston, but is a condition which our city shares with every large municipality, and the latest proposed change has come in for its full share of unreasoning, selfish opposition. As the laws at present stand, the so-called down-town district, including all of the business portion of the city, and a considerable portion of what is known as the Back Bay, which is now residential, but which is rapidly becoming a business section, is restricted so that no wooden structure except wharves, etc., can be built therein. It has now been proposed to extend the so-called fire limits so as to include a very considerable portion of Roxbury and Charlestown immediately adjoining on the south and north. The change in the law apparently comes at the suggestion of the underwriters, and of those who have the best interest of the city as a whole at heart; and it is an improvement which appears to be supported by the best architects and builders as well as by the majority of the building inspectors, but it seems to encounter a very unanimous opposition on the part of all real-estate owners and operators. The proposed changes, if put into effect, would, in general, prohibit the erection of wooden buildings of any description throughout the whole of the city proper, and a considerable portion of the suburbs, and it is this prohibition which seems to be viewed by the real-estate people as unnecessary, tending to reduce the valuation of the city of Boston, and as a usurpation of the people's rights.

It is taking long generations for this country to appreciate the innate wastefulness of cheap construction, and the traditions of wooden dwellings have been so rooted in our ideas of constructive possibilities that it requires a very determined effort to overcome the kind of arguments which are put forward against such a bill as has just been described. The dangers to a city from the closely contiguous suburban district built up of inflammable construction have been demonstrated so often, and the results of such conflagrations as will arise from time to time in a wooden district are so tremendous, that it would have seemed to be unnecessary to urge the adoption of more restrictive methods. Indeed, we believe that the principal remonstrants to this bill were actuated more by an unwillingness to add any restrictions whatever to their individual plots of land than by any conviction that the proposed law would not in the long run prove an advantage to the city as a whole. And however strongly opponents might argue against brick structures for other people, we have no doubt that if a personal matter were made of it, they would much prefer to live in a residential quarter built up of properly designed masonry houses than to live even upon the borders of a wooden house district. The argument that wooden houses are cheaper than brick ought not to count at all in the consideration of this proposed law. There are very few large cities that are not already possessed of far too many cheap houses, and if a low expense is to be considered, it can be shown by a very simple computation that, taken through a course of twenty-five or thirty years, a well-built brick house is cheaper, costs less money, and will rent for more than one built following the ordinary methods of wooden construction. If we are to have inexpensive residences, they can be built as a more permanent investment, will yield in the long run a better return on the capital, and can be made in every respect more habitable if properly constructed of brick than if of any other material, while the saving in insurance rates and the indirect saving in the exemption from large conflagrations, ought to be considered as of so much public value that private desire for exemption from restrictions would not weigh at all. There seems to be an unfortunate idea that a brick house can only be built as one of a block, that if we are not to build wooden houses we must perforce build long, dreary blocks of brick structures. If this were the inevitable consequence of the extension of this law it would certainly be deplorable; but we believe if such a law were to go into effect, we would see quite as many isolated houses, the city would have more real value, and so far from the houses being more congregated, we believe there would be quite as much isolated construction, and probably more, for in the same districts, given a necessity for a slightly more expensive construction in the first cost, the probabilities are that such structures as are put up would be owned by those who could afford more land around their houses. It seems to us there is every reason for, and no fair, valid reason against, the reasonable extension of the limits wherein nothing but masonry structures should be permitted, and this condition applies to every city in this country.

At one of the hearings on the opposed bill a suggestion was made by Mr. William Atkinson, an architect of this city, which as a compromise measure is certainly deserving of careful consideration. Recognizing the reluctance of property owners to yield to limitations upon their property, he suggests that the act be in such form that structures of wood must be separated from each other by a considerable distance, not less than twenty feet, so that the conflagration of large blocks of wooden structures can be avoided, and the fire loss correspondingly diminished. Mr. Atkinson expressed a belief that under such a law as this the property owners would find it cheaper to build of brick and cover more of their land, and that the final result of this law would be in time the same as if nothing but brick were to be allowed. This amendment is a good one, though we feel that the quicker a great city can arrive at a basis of reliable, fairly fire-retarding construction, the better it will be for both the individual property owner and the city at large.

A FIRE occurred at night, April 2, in the new building of the American Soda Fountain Company, 278 Congress Street, Boston. The night watchman, in going his rounds, noticed that a sprinkler had opened, and, being entirely ignorant of the fire, rushed to section valve on first floor and closed it. The sprinkler alarm was ringing but was unheard by the watchman, it being located in a closed room on the first floor. The floors were constructed of concrete, and supposed to be waterproof, but allowed the water to run through and caused damage to be done to four stories. The action of lime (in concrete) with water passing through caused silver-plated ware to be turned black, necessitating replating and polishing.

THE American Institute of Architects has leased the Octagon House, perhaps better known as the "Tayloe Mansion," Washington, D. C., as a permanent home for the Institute. The building is an interesting specimen of brick colonial architecture, both in its detail and well-studied plan. A committee has been appointed to put the building in thorough repair and make needed alterations. It will in the future serve as the regular gathering place for annual conventions.

THE New York chapter of the American Institute of Architects has submitted the following names to Mayor Van Wyck for appointment on the commission to formulate a new building code for Greater New York: George B. Post, Louis de Coppet Berg, Cyrus L. W. Eidlitz, L. F. J. Weir, R. W. Gibson, and George Keister.

THE Thirty-second Annual Convention of the American Institute of Architects is to be held in Washington, D. C., on Tuesday, Wednesday, and Thursday, November 1, 2, and 3. The local committee of arrangements consists of Messrs. Glenn Brown, Robert Stead, and Edward Donn, Jr., all of Washington.

THE Rotch Scholarship for 1898 has been awarded to Mr. L. C. Newhall, of Malden, Mass., a draughtsman in the office of Mr. Arthur H. Bowditch, of Boston. Mr. Newhall is the fifteenth holder of the scholarship.

NEW YORK insurance companies are willing to insure the new thirty-two story fire-proof syndicate building on Park Row, New York City, for $675,000, for five years, at a total premium of $675.

THE vacation traveling scholarship, instituted a year ago by the Boston Architectural Club, has been awarded for the present year to Mr. Albert C. Fernald.

THE new building ordinance of Chicago limits the heights of buildings to ten stories and 130 ft.

PERSONAL AND CLUB NEWS.

W. DOUGLAS HILL, architect, has removed from Pottsville, Pa., to Newport News, Va.

H. A. BETTS, architect, Milwaukee, Wis., has removed his office from the Goldsmith Building to the Colby & Abbott Building.

CHARLES E. DAWLEY, architect, has opened offices in the Bushnell Building, Springfield, Ohio.

THE Tenth Annual Exhibition of the work of the pupils of the Detroit Museum Art School was held in the east gallery of the Detroit Museum of Art from June 1 to 5.

THE WASHINGTON ARCHITECTURAL CLUB held its annual meeting Saturday, June 4, and elected the following officers for the ensuing year: President, Edward W. Donn; secretary, Arthur B. Heaton; treasurer, W. D. Windom; directors for two years, T. F. Laist and W. J. Marsh; for one year (to fill unexpired term) T. J. D. Fuller.

After the election, the constitution of the Fine Arts Society of the District of Columbia was accepted and the following delegates to that body were elected: T. F. Laist, W. D. Wood, T. J. D. Fuller; and as alternates, W. D. Windom, P. C. Adams, and E. R. Crane. Frank Upman and Harry Dodge Jenkins, of the Chicago Architectural Club, were admitted to membership.

ILLUSTRATED ADVERTISEMENTS.

THE accompanying illustration, representing the "Good Samaritan," is a panel in terra-cotta executed by the New York Architectural Terra-Cotta Company.

Number twelve of the series of "Brick and Terra-Cotta Fireplace Mantels," of which J. H. Ritchie is the designer, is illustrated in the advertisement of Fiske, Homes & Co., page vii.

The residence of James G. Pontefract, Esq., at Allegheny, Pa., of which Longfellow, Alden & Harlow were the architects, is illus-



trated in the advertisement of the Harbison & Walker Company, page xv.

A staircase (Guastavino construction) in the open shaft of an eight-story hotel is shown in the advertisement of R. Guastavino Company, page xx.

Two views of the plant of the Celadon Terra-Cotta Company, at Alfred, N. Y., one of the factory in 1888, and the other of the plant as it is to-day, are shown in the company's advertisement on page xxvii.

PLATE ILLUSTRATIONS.

PLATES 41 and 42. Phillips Brooks House, Harvard College, Cambridge, Mass., A. W. Longfellow, Jr., architect. After the death of Bishop Brooks his classmates decided to erect a building as a memorial to him and to his unlimited interest in the religious

life of Harvard. It was decided to raise $300,000 and to call the building Phillips Brooks House. The endowment was to be applied under the direction of six trustees, of whom no more than two were to belong to the same religious denomination.

The committee raised much less than was expected (only about $50,000), and so the original broad plans of erecting a building "dedicated to the comfort and succor of all in the college world who were in trouble, sorrow, need, sickness," had to be given up, and only the chief purpose, affording a home and workshop for all forms of spiritual activity and benevolent action in the university, could be realized.



OCTAGON HOUSE, WASHINGTON, D. C.
Recently leased by the American Institute of Architects for permanent headquarters.

The building is to be on a line with Holworthy and behind Stoughton in such a way as to form, with Holden Chapel in the center, a pendant to Harvard Hall, and to give a generally symmetrical arrangement to that portion of the yard. Its position has been further emphasized by a colonial treatment of red brick with light stone trimmings in keeping with the design of Harvard Hall and the other old brick buildings. The same height of cornice has been followed, and the feeling of the old work has been preserved as far as possible.

It has been found necessary, from an architectural point of view, to reconcile the building to its position by a frank treatment of the triangular space in front. This has been made into a forecourt by means of a wall on the east running to the street, and by carrying along the front a fence of iron with brick posts and an ornamental gateway in keeping with the Harvard gates. This fence, if continued on either side in the future, will serve to reconcile the building still further to its position. The court in front is designed as a small, quiet garden to be laid out with vines and formal planting toward the street, and a stone seat against the wall at the widest part.



PARLOR MANTEL, OCTAGON HOUSE.

Plate 43. Detail of porch and front entrance, Phillips Brooks House, at Cambridge, Mass., of which A. W. Longfellow, Jr., is the architect.

Plate 44. Building for the Lutheran Publication Society, at Philadelphia, Pa., Frank Miles Day & Brother, architects.

Plates 45 and 46. The Bowlby Building at St. Paul, Minn., Cass Gilbert, architect. It is built of cream-white terra-cotta. The figures of the boys in frieze, and the circular panels back of them are done in color, and are finished in enamel in some parts, and glazed in others, the enamel being an opaque material, and the glaze being transparent, showing the terra-cotta through.

Plate 47. Warehouse building for T. Blood & Co., at St. Paul, Minn., of which Cass Gilbert is the architect. The Boston Northwest Real Estate Company are the owners.

Plate 48. Business block, St. Paul, Minn., Cass Gilbert, architect. The façade of this building is made particularly interesting by the color scheme introduced. It is built of a reddish-brown brick in two shades, the color being arranged in patterns, as indicated in the illustration.



HALL, OCTAGON HOUSE.

The American Schoolhouse. VIII.

BY EDMUND M. WHEELWRIGHT.

IN the sketch plans submitted in competition for the Providence High School, the central window generally placed in the wall opposite the teacher's desk is omitted. This is a method of fenestration often found in French schoolhouses. In the Brookline High School (for plans see second paper of this series) there are no windows in the walls facing the teachers' desks, in that following the method generally found in German schoolhouses.



HIGH SCHOOL, NEW BRITAIN, CONN.
William C. Brocklesby, Architect.

In the Brookline High School toilet rooms are arranged in mezzanines of the first story. These rooms are accessible from the staircase landing and give a compact and convenient arrangement. In this school appear also features which, I believe, were novel when the building was built, but which have since become well-nigh constant in large high schools, — a bicycle run to basement, and storage room for bicycles.

In our latest high schools we find the lunch room no longer a makeshift arrangement, but that it has become one of the customary and carefully considered requirements of such buildings. This feature was well provided for in the Cambridge High School, and again in the Brookline school, as it is in nearly all the large high schools built during the past few years.

It will be remembered that Dr. Philbrick speaks in his report of his desire that such a lunch room should be established in the Latin and English High School of Boston.

The Cambridge and Brookline schools have separate wardrobes adjoining each schoolroom. In the Brighton High School (see plans in second paper of this series) the pupils' clothing is kept in individual lockers in the basement. This later method of clothing disposal was, I believe, first introduced in the schools of Cleveland, Ohio, whence the idea came for its use in the Mechanic Arts High School in Boston. It was later used in the Brighton High School, and is that adopted in the designs of several new high school buildings which are about to be built in Boston. This method of disposing of the pupils' clothing permits more economical planning than the arrangement of separate wardrobes for each schoolroom. It is found to be entirely unobjectionable, and since it dispenses with the separate wardrobes, a feature developed from the necessities of discipline of the graded schools, it would appear to be the most desirable arrangement for high school pupils.

The lockers are made of ash with floors, and top and bottom panels of the doors of strong wire netting. If it is necessary to economize space, the floor area of each locker need not exceed 16 by 16 ins., and it would seem feasible, if closer arrangement were found to be necessary, to arrange the lockers in two tiers, with access given to the upper tier by a ladder running on a track, an expedient sometimes used to reach the upper shelves of a high bookcase. The lockers may be fitted with inexpensive combination locks, in which case the janitor keeps the record of the combinations, or each pupil may be provided with a key, the janitor having a master key. The rooms in which these lockers are placed should be sunny, if possible, and it should be strongly ventilated. It is better to have



SECOND FLOOR.



BASEMENT.



GROUND FLOOR.



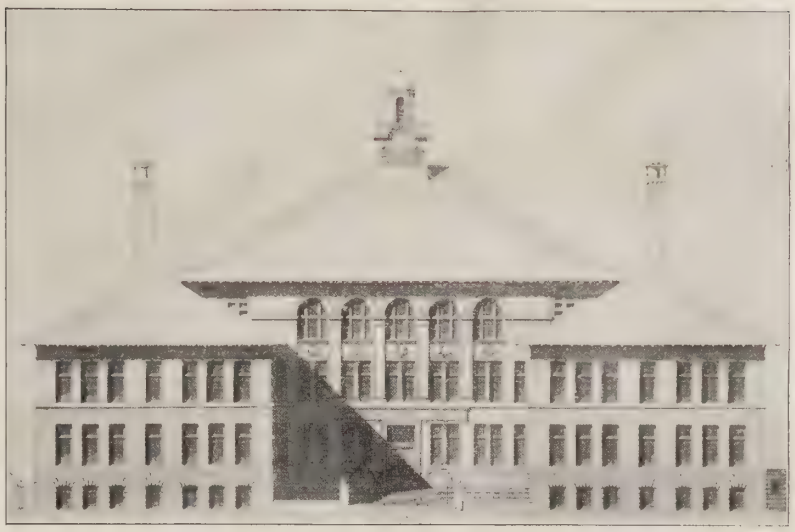
FIRST FLOOR.

HIGH SCHOOL, NEW BRITAIN, CONN.

the room ventilated through the lockers than to have the lockers ventilated through the rooms.

The "hospital" or "emergency" rooms were, I believe, a feature first introduced in the Cambridge High School. These rooms are provided in the Brighton High School and the New Britain school.

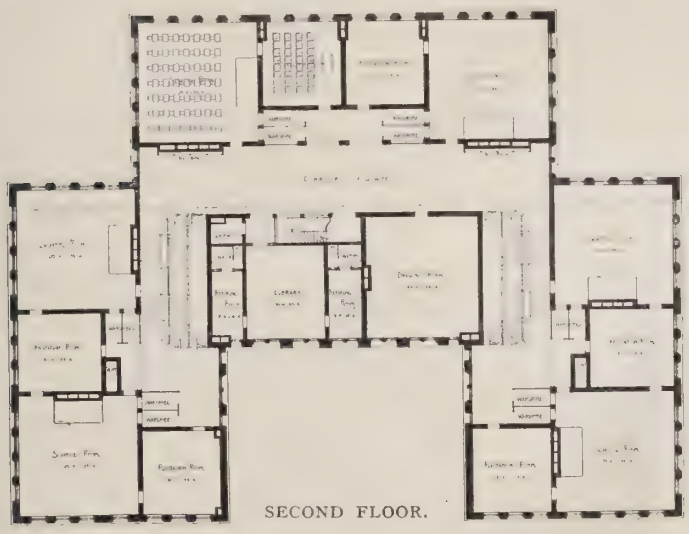
This last-mentioned school is a remarkably compact and well-planned building. It has all the essential requirements of the very latest high schools. The rooms for pupils' clothing are placed upon each story, and does not follow the grammar grade method of separate wardrobes adjoining each schoolroom.



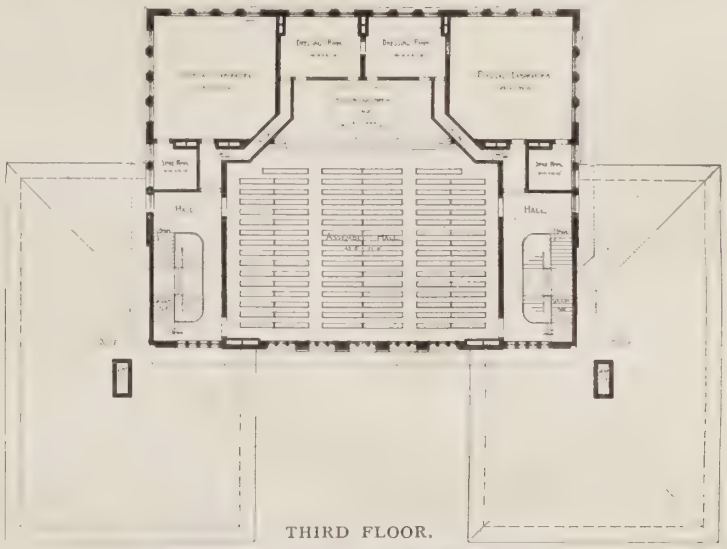
DESIGN SUBMITTED FOR HIGH SCHOOL, PROVIDENCE, R. I.
Stone, Carpenter & Willson, Architects.

The library is becoming a more important feature in high schools and in grammar schools also. This room may be given a northerly exposure. This exposure is that most desirable for drawing rooms. It is requisite that physical laboratories should have one wall with exposure to the sunlight. The room for storage of physical apparatus should be made as secure from the admission of dust as is possible.

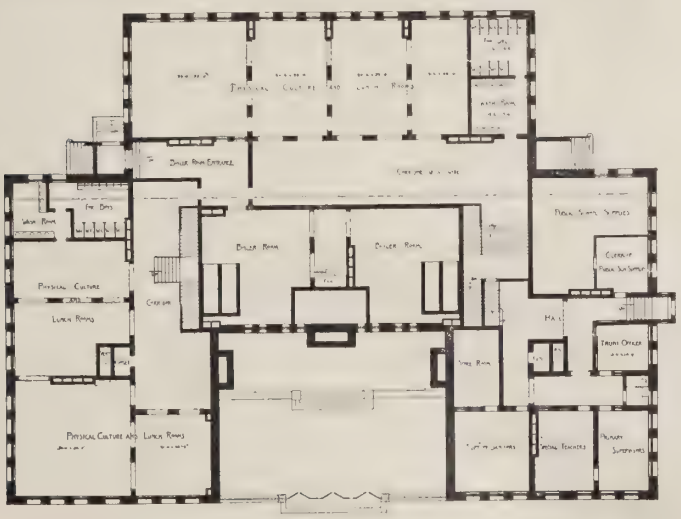
As the methods of instruction in high school houses approximate more closely to that pursued in our colleges, it would be possible to effect considerable economy in the construction of high schools if, instead of providing schoolrooms to accommodate between forty and sixty pupils, large rooms for one hundred pupils were given. Such rooms are generally provided in English and French schoolhouses. This arrangement would make a large number of recitation rooms desirable. Recitations of small classes may, however, be conducted in these large rooms without disturbance to those who are at their studies. Such a method would appear to tend towards the goal of the most enlightened educators and the development of increased self-reliance at least among pupils of the high school.



SECOND FLOOR.

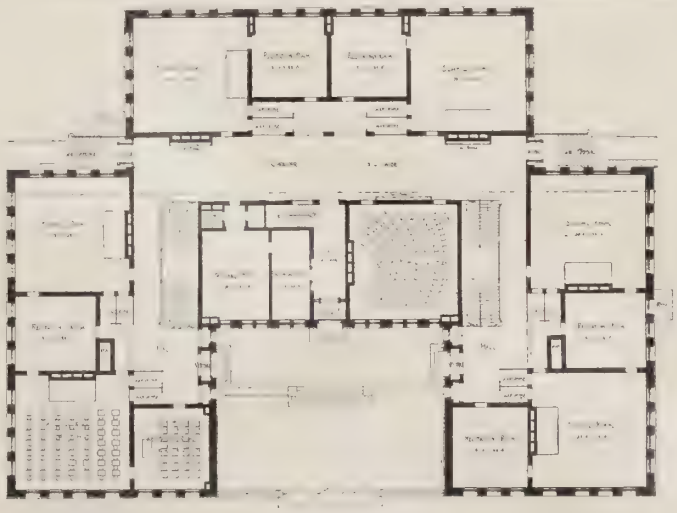


THIRD FLOOR.



BASEMENT.

HIGH SCHOOL, PROVIDENCE, R. I.



FIRST FLOOR.

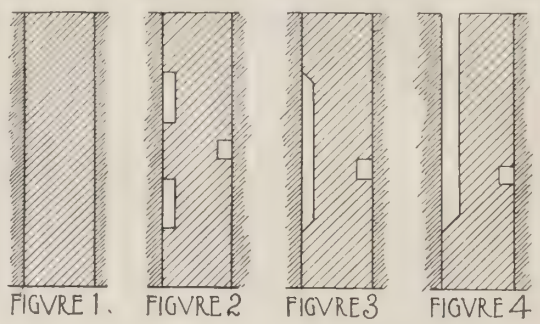
The only later-day feature which appears to be lacking in the New Britain school is a bicycle run to basement. The central light shaft is designated upon the plan as a "courtyard." This is a misnomer, as the dimensions of this feature do not warrant such a title; indeed, the space here assigned would appear to be even too scant to light satisfactorily those rooms on the first floor which gain their light from this source. The gymnasium has a running track in the gallery which is served by two staircases. Lockers for both sexes adjoin the gymnasium, receiving light from the central light shaft.

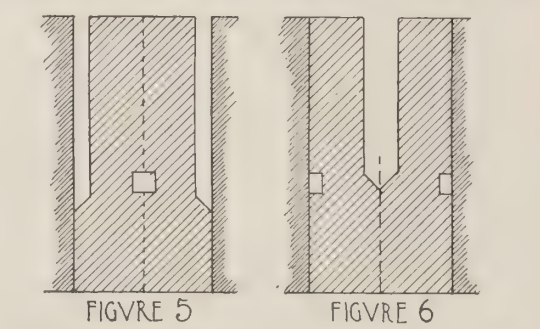
Architecture of Apartment Buildings.

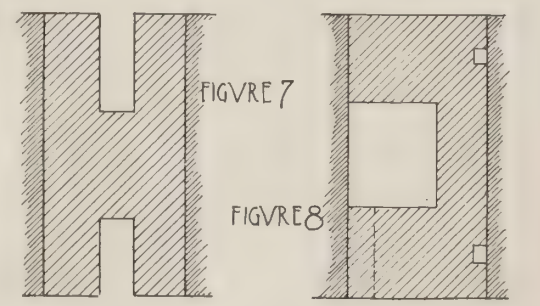
I.

BY IRVING K. POND.

APARTMENT buildings offer about as great variety in plan as do the ordinary city residences, up to and including even the more expensive detached houses. It is due in great measure to structural necessity that the various stories of an apartment building repeat, with slight variation, the chord (or discord) struck in the principal story. It is through no such necessity that house after house, in block upon block, drums monotonously on one note. This is due in part to lack of imagination in the designer, — which is a misfortune; but in greater part it is due to the general desire of speculative builders to give little and receive much, — which is a fault. This misfortune has led in apartment buildings to a deal of trivial and inconsequential planning, and the fault has so overcrowded the ground, to the exclusion of light and air, as to bring it under the ban of State and municipal authority and make the tenement house and the apartment building in crowded centers of population subjects for serious consideration to the philanthropist and social reformer.







If lack of imagination, with its resultant dreary commonplaceness, is indeed a misfortune, no less so is untamed imagination, with its equally trivial and perhaps more harmful emanations. Generally, however, where a too vivid imagination seeks to play about a problem affecting returns from financial investment it will meet restraint in the conservatism of the investor, voicing what he believes to be public opinion.

Unfortunately, this conservatism makes against innovation wrought out by trained skill acting under guidance of cultivated imagination almost as effectually as it curbs the playful antics of the untutored mind. It is this conservatism which makes difficult the first step beyond the bounds of what is (and being *is*, supposedly, is right). The reformer moves, and laws embodying sanitary measures appear; he may move again, and laws are enforced. The philanthropist takes up the work, and sanitary tenements arise amid wholesome conditions; but real estate investors as a body are neither reformers nor philanthropists, and do not move except as public opinion impels. One, adventuresome, takes a step in advance, or the step may be taken in meeting a certain contingency; should the result prove popular, others follow. This statement is in no way made to hold the investor up to blame either because of his seeming timidity or because of what really may be a reasonable conservatism, but it is made simply as a statement of fact which in itself explains the apparent slowness in the development of the medium type of real estate and apartment house, and shows sufficient reason why the many radical ideas in which their authors see naught but good (and which indeed they may contain) are not on the instant realized in permanent building materials.

Yet none the less, in spite of conservatism and ingenuity lacking in real vitality, the apartment building has developed in plan till now numerous and distinct types exist side by side. It is the purpose of this article to present for comparison and for contrast various of these types.

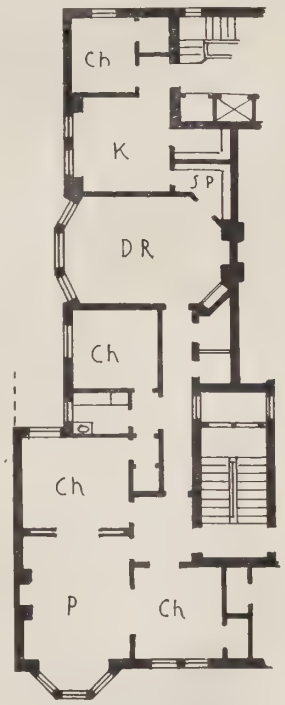
The relative importance of apartment buildings and single or private houses in modern social and domestic economy needs not to be discussed here. The apartment is here and will develop as long as men crowd into the existing centers of population or create new centers. The apartment is very much in evidence in modern domestic economy, for it was the necessity for economy which first suggested it; and the idea of economy will not separate itself from the idea of the apartment for some time to come. The economical housing of the multitude within the gates must be as thoroughly and as scientifically studied as is the economical transportation of this same multitude. Economical, safe, and rapid transit to economical, safe, and quiet domicils is the ideal to be sought in the great cities. It may be too much to expect that rapid transit ever shall become so much of a pleasure that people shall find luxury in the personal employment of its means; but it is not too much to expect that the apartment shall be as convenient in its arrangement and as complete as any house, and while being economical in maintenance, present at the same time high possibilities of taste in its plan and general decorative treatment, so that the ideals of economy, privacy, convenience, and beauty shall be realized.

In even a superficial study of the development of the apartment building its lower form, the tenement house, must be noted; for here the struggle for decency and hygienic conditions began and was fought bitterly, to the outcome that many of the tenements of to-day are better planned as to light, air, and privacy than many of the more recent medium-priced apartments in highly respectable neighborhoods. The first move in tenement-house reform was to bore wells down through the roof and various stories, and so relieve the dark inner chambers which had been utterly devoid of fresh air and daylight. In many tenement houses chambers were in series four or more deep, the second borrowing its light and air from the first, the third from the second, the fourth from the third, and so on. Not infrequently was entrance to the farther compartment to be effected only through the nearer. The "toilet room," to use so unoffensive a name for so hideously offensive a thing, was but a black stench hole, and running water was to be drawn on but one floor. Municipal regulation framed and enforced by philanthropists and reformers mitigated much of all this evil.

That which, next to greed and carelessness, most contributed to this state and still makes the problem of light, and air, and economy of construction a serious one even in the better class of apartments, is the form of the city lot with its long, narrow proportions. The problem of the tenement house was not solved until two or more adjacent lots, even to the extent of a city block, had been utilized for one scheme of building, and, by means of the courtyard, sometimes amounting almost to a park, all light wells had been banished, and all rooms, for what purpose soever, furnished with light and air direct. It is probable that the highest type of apartment building is to develop along this line, that is, about a courtyard or garden. This is the continental idea even where the comparatively narrow lot is to be contended with.

The process of development as regards utilization of ground area may be seen at a glance by referring to Figs. 1 to 4 for the single

narrow lot, and to Figs. 5 to 8 for double lots. Fig. 1 shows how absolutely light and air were excluded from the interior portions of the building in many metropolitan tenement houses not many years ago and previous to enforced use of wells, which were sunk as in Fig. 2. The scheme presented in Fig. 2 and its modification, as in Fig. 3, are in use to-day in apartments commanding fair rents, in comparatively respectable neighborhoods of our greater cities, and in many instances without the individual shaft for bath and toilet rooms which is indicated in Figs. 2, 3, and 4. It would be unprofitable to argue with a sane man for a hygienic principle in these enclosed areas for light and air, and all well-wishers of the multitudes who are forced to dwell in apartments look forward hopefully to the day when it will be equally futile to argue their financial benefit to an owner. In many cases this area, where it occurs in the center of a double building, is covered with a skylight at the roof and inadequately ventilated, which indeed would be the case were the skylight removed entirely. The roofing by skylight of shafts which give light and air to chambers or living rooms is barred by law now in every city which has a building code, and the practise must soon become a thing of the past.



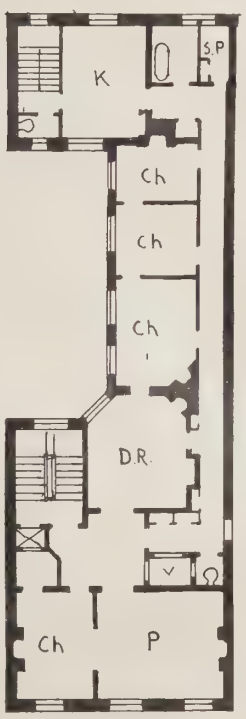
FIGVRE 9

The great step toward agreeable and sanitary conditions was made when the scheme suggested in Fig. 4 was adopted, and this scheme is now at the base of the plan of the great majority of better class apartment buildings in our city blocks. Of course the ideal sanitary condition is far away, while the bath rooms of more than one apartment give upon the same enclosed shaft, and is not reached until bath rooms open to the free air; but the court, unenclosed at one end and free from ground up, is a great advance, and depends only on its width and direction toward the sun to be ideal, from the sanitarian's point of view. Figs. 5 and 6 show possible combinations of the scheme in Fig. 4 on a double lot. The combination shown in Fig. 5 on a double inner lot is to be employed in general only under the necessities of strictest economy, for unless additional light from neighboring lots is assured, or the double lot itself is more than customarily wide, the divided court is insufficient for first-class apartments. In the scheme in Fig. 5 there is a great economy in walls and foundations, and if the bath rooms are placed on the inner shaft, cost of plumbing and sewers is reduced; but this latter saving is not commensurate with the advantage in sanitation and privacy which is gained by placing the bath rooms on the open court.

Figs. 7 and 8 present other schemes for the introduction of light and air into buildings on double lots. The idea in Fig. 7 is to shorten the narrow light courts and more effectually cheer the inner portions of the structure. To make an effective façade, the courts in this scheme should be wide enough to form a terrace or garden. Fig. 8 presents a continental scheme with apartments fore and aft, and a court sufficiently extensive to be capable of an attractive treatment in its gardening, and effective in architectural surroundings.

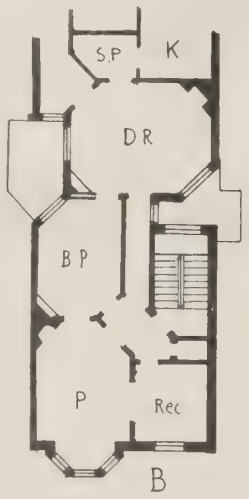
In discussing in detail the possibilities of arrangement within various outlines, any scheme possible within the outlines laid down in Figs. 1, 2, and 3 may be ignored as unworthy of further study, for no plan can be considered seriously in which living rooms give upon an enclosed shaft, or even upon an enclosed court, unless that court be more than ordinarily ample, so ample indeed as to amount to a free air space. One can conceive of a court entirely hemmed in, which by its size and condition shall be open to the rays of the sun, and so be more sanitary than some long, narrow, open courts into which the sun hardly can penetrate; but however courts may be employed, shafts on which open other than stairways or subordinate toilet rooms are to be shunned.

Also to be set aside as unworthy of consideration are all types of plans in which chambers, or living rooms, or general toilet rooms are to be reached only by passing through other rooms. To maintain the dignity and at the same time preserve the privacy of the family life has been the study of the best designers of apartment buildings in recent years. It is a comparatively modern and altogether American idea that the chambers and toilet rooms of an apartment should be as isolated as are the same rooms in a private house. The seemingly necessary position of the kitchen in the rear of the apartment has hampered the development of this idea. Because the kitchen was at the rear of the house seemed, probably, sufficient reason for placing it at the rear of the "flat," and besides, that is the position always given to the kitchen in the apartments of the French who, at least until recently, had been considered masters in the art of apartment planning. The American idea, which finds no prototype in the French or English, is that the dining room, serving pantry, and kitchen shall be *en suite*. This has led to the development of a type shown in Fig. 9, a type which, in greater or lesser degree of perfection, rules in our cities to-day. The long intervening corridor between dining room and living room or parlor, as it generally is called, which necessitates passing all chambers in the tour from one of these rooms to the other, is held to be the objectionable feature of this arrangement, and objectionable it is if chambers open directly from it on one side, and toilet room directly from it on the other, as is too often the case; but the majority of owners and designers balance over against this objectionable quality the great economy in space which is effected by this plan, and economy seems the more to be desired, and this type prevails. When the building lot is small and is completely utilized from front to rear, and rooms are curtailed in number and are of the least allowable dimensions, one need not argue against this plan; but when there is offered an opportunity to expand, then the belief grows that economy may overreach itself, and that added convenience and desirability will force a more than proportionate return on the small added investment. This added convenience and desirability is coming to be considered a necessity, and consists partly in having the dining room and parlor *en suite*, or, at least, separated by no more than the reception hall, as in the smaller city house. This has been the commonplace in European apartments, and seemingly no other scheme has been thought of. But Americans demand also, as has been noted, that the kitchen shall be very convenient to the dining room, and this, which American designers have accepted as part of the great necessity, and a large part at that, appears never to have occurred to their continental brethren, at least never to have troubled them. The Frenchman has dealt and continues to deal with the problem as indicated in Fig. 10, only that in the vast majority of instances the dining room lies across the antechamber or reception hall from the entrance to the long corridor; and it appears to present no drawback to a French apartment that servants, in preparing and clearing the board, are compelled to traverse the reception hall and the long corridor to the kitchen and serving room beyond the region of the less



FIGVRE 10

important chambers (for the principal chambers are grouped about the parlor or salon, generally). Without doubt it is fine in imagination to behold the great retinue of servants and retainers bearing the steaming meat and the viands in procession along the corridors and through the halls of state, as in good old baronial England; but what food for imagination is there in a lorn maid bearing across the reception hall the lone codfish ball and the belated breakfast tea? However it may be with republican (?) France, it would seem that democratic (?) America demanded that the commonplaces of service be as little as possible in evidence in the home life. That misguided sentiment which made every man's house, not in real spirit, but only in seeming reality, his castle was responsible for much vulgar display of shingled towers, and tin turrets, and brutal, rock-faced walls in the domestic architecture of this country, and a fevered imagination feeding on the life in the medieval castle may well tend, if not restrained, to vulgarize the life of to-day. In the American apartment no deep-seated precedent hampers, and there it is possible to make the setting of a family life which shall be direct and simple, and free from vulgar display and ostentation.



FIGVRE 11

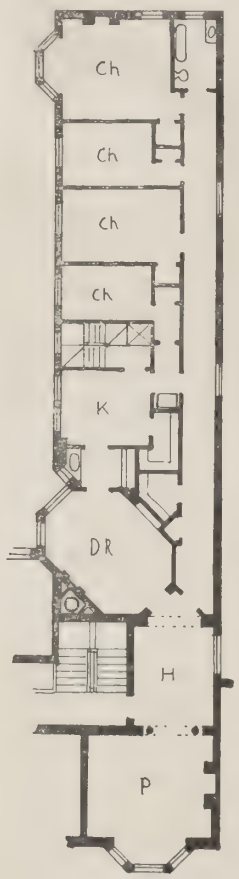
The grouping together of the parlor (and library), reception hall, dining room, and kitchen is purposely to, and does, make possible the isolation of the chambers and toilet rooms from the remaining portion of the apartment. That this separation is absolutely essential to the perfect enjoyment of life in an apartment need not be argued; but when it is achieved at the expense indicated in Fig. 11 (A and B) the plan is worthless and lacking in desirability as compared with the earlier plan developed along the lines indicated in Fig. 9. Fig. 12 shows a development of the newer type, which has been found to be highly attractive. The one point, or rather line in all plans of this general type is the long corridor, which, from an esthetic point of view, is not so attractive as is the stairway of the house, but this must be offset against the convenience of the general plan. And the long corridor of course is necessary only in buildings on the long narrow lot, and it is away from this that designers are striving to get, by various ingenious combinations.

CLIPPINGS.

GREAT importance attaches to the statement made by Mr. L. L. Buck at the last meeting of the A. S. C. E., that deep corrosion results from the contact of limestone in concrete with metal. This fact is said to have become apparent in the anchorage of the suspension bridge at Niagara, the main cables of which are imbedded in a concrete made of limestone. The discovery was recently made that at the points of contact between the spalls and the wires, the latter were badly corroded and in some instances entirely severed. — *Architecture and Building.*

IT is reported that one feature of the new building law for Chicago will be the architects' responsibility for their specifications and the strains and weights in building. In the matter of permits these will not be passed upon unless architects figure out their own weights. This regulation seems naturally to follow in the wake of the new law for licensing architects. They should welcome the responsibility proposed to be thrown on them by the new law. It is one that men skilled in their art can readily meet, and will do more to raise the standard of their profession than the lax, haphazard regulations that have prevailed so largely in the past. Such a regulation will do much to prevent flimsy building. When the highest standard aimed at was to build just good enough to pass the building department frequent accidents were inevitable. No architect will be likely to risk this responsibility, and the result will be that a large class of builders who have heretofore depended upon incompetent draughtsmen for their designs will feel compelled to seek the aid of the architect. — *Architecture and Building.*

ARCHITECTS and owners of real estate should take to heart the discussions which have been going on for some days past among the officers of insurance companies, in relation to the proper rates of insurance for fire-proof buildings of the modern kind. It will be remembered that, a few months ago, reductions were made in the rates of premium on certain classes of buildings in New York. This reduction led to a demand for reductions on other classes of buildings, and to a certain demoralization in rates generally, which, as usual in such cases, resulted in competition among the companies for policies on the best sort of risks. Such risks, apparently, they consider to be presented by the great fire-proof office buildings, and premium rates on these have fallen to a point almost unheard of in this country. One company is said to have offered to write a policy for a million dollars on the Clearing-House Building for five years, for five hundred dollars. This is one cent per year on each one hundred dollars of insurance, and the Clearing House is situated in the middle of a block, on a narrow street, and surrounded by old buildings, so that it is by no means the best risk of its kind. The manager of another insurance company is reported to have said that, "If we wrote fire-proof buildings for nothing we should lose but little. Total destruction of the steel-constructed office buildings of this city is practically an impossibility." Considering how short a time has elapsed since the insurance companies found little or nothing to commend in steel-constructed office buildings, professing to regard them as exposed to frightful but mysterious hazards, from which ordinary structures were exempt, it is with a certain astonishment that we read these new deliverances; but the fact appears to remain that steel-constructed buildings of the sort that American architects have learned to design and carry out can now be insured, with their contents, at a rate which makes it for the interest of owners to erect them. The tendency in all our cities is toward the concentration of masses of goods in warehouses, so that a building costing a hundred thousand dollars may contain a million dollars' worth of merchandise. Supposing the insurance on the merchandise, if stored in an ordinary building, to be 1 per cent. a year, and if stored in a fire-proof building, to be one tenth of 1 per cent., which would still be ten times as great as the clearing-house rate, the saving to the owner of the goods, by having them placed in the fire-proof building, would be nine thousand dollars a year. If the owner of the goods were also the owner of the building, this saving, added to that on the insurance on the building itself, would pay the interest on the extra cost of fire-proof construction over that of the ordinary kind about ten times over; while, even if the owner of the building had no interest in the goods, the owner of the latter would be glad to pay a part of the saving in his insurance in the shape of an extra rent, which would abundantly compensate the proprietor of the building for his extra outlay. — *American Architect.*



FIGVRE 12

Notes on Terra-Cotta for Exterior Polychrome Decoration.

BY ELMER ELLSWORTH GARNSEY.

THE practise of modern architecture involves the solving of the most complicated problems of design and construction; and one has but to visit any large American city to be impressed by the masterly way in which our engineers, architects, and builders have met and battled with these intricate questions.

There is an inspiration in the sight of the huge buildings which tower a score of stories along either side these cañons we call our city streets, and the imagination is stimulated when we contemplate the possibilities of urban architecture in the years which are to come.

It is a new method of construction, rather than a new school of architecture, which has so rapidly developed at our end of the nineteenth century, and it may be said that more triumphs of construction and engineering than of pure architecture have been achieved. But as the utilitarian has always preceded the esthetic, it cannot be doubted that the genius which has already conquered the laws of matter will, in time, bring under equal subjection the more pliant sympathies of art.

No Greek or Renaissance architect was ever confronted with such recurring problems of space and utility, of cost and time; and some of our critics apparently lose sight of this fact; and it may be held a truism in these days that great works of art require both deliberation in conception and despatch in execution, and that these are not to be had at slight expense.

The modern tall building has come to stay, and it must be accepted henceforth as a ruling factor in city architecture.

The area of its base is fairly fixed by the comparative smallness of city plots, and its skyward tendency is scaled by the value of the land in which its foundations are planted. Structural steel and express elevators, those swift *fin-de-siècle* mercuries, make possible the heights attained, and the question of a beautiful city has been reduced in great measure to the solving of the problem of the exterior design and enrichment of these great structures, the clothing of gaunt steel skeletons with coverings of beautiful texture and color.

The ancients had no constructions of steel demanding marble, terra-cotta, stucco, or other veneers, but they applied these incrustations to structures of brick and stone with marvelous effect and durability.

At Girgenti, in Sicily, the stucco still remains on many drums and capitals of columns which have been thrown about by earthquakes and received the buffeting of storms for more than twenty centuries.

In the museum at Palermo are terra-cotta friezes and cornices from Selinunto and other Greek ruins in Sicily, retaining their colors and patterns, which have withstood the ravages of time and the elements for even a longer period; and at Pompeii are found great quantities of terra-cotta antefixes, cornices, water-spouts, and almost every sort of architectonic enrichment, which have undergone the trial by fire as well.

Marbles have crumbled and bronzes have lost their original perfection of surface, while the baser clay still shows the touch of hand and tool impressed in its yielding surface before the dawn of the Christian era.

From the practical point of view, therefore, burnt clay may well be classed among the most valuable materials for exterior veneer, while it is not to be despised as the vehicle for more refined treatment for interior work, and even figure sculpture.

It retains the personal touch of the artist or artisan, and is not a translation by the chisel from an original model in a different material.

But above all other considerations, the value of terra-cotta as an exterior covering or enrichment on modern large buildings lies in its adaptability for color treatment, the absence of which is no less remarkable than regrettable in contemporaneous architecture.

The artistic eye does not seriously resent the typical red brick front with white marble trimmings along the streets of Philadelphia, because the houses are small and do not insist on occupying the entire field of vision; but multiply such planes by ten, placing them one above the other, and what a monstrosity we should behold!

The paler, almost colorless brick, which has had such vogue in recent years, is hardly more agreeable when used in huge unbroken masses, save in a negative way; and architectural color blindness, as exemplified in exterior construction, seems to consist of an absolute inability to conceive of other color harmonies than those of similarity.

To no other source can be traced the conception of these great façades of pallid gray or opaque yellowish white, without a trace of color from the topmost cyma down to the lowest base course, while even the window frames, sash moldings, and often iron grilles as well, are painted "to match."

It would seem reasonable that while the mass of the building might be best expressed in one general solid color, that the decorations of surface and details of ornament would be much more effective, especially at considerable heights, if rendered in contrasting and more positive colors, whether these details are rendered in relief or not.

The diffusion of light and reflections thrown up from below rob shadows and moldings of their true value and reason for being, and the loftier stories of tall buildings seldom appear to have due definition; therefore, if the grounds of entablatures, friezes, capitals, and possibly flutings of columns, decorated moldings, dentil courses, etc., were treated in polychrome, these would all gain in definition as well as in effect, without losing an iota of their intimate relation to the whole structure, while they would bring into the scheme a charming play and sparkle of color.

It would be most interesting to introduce more richly colored terra-cotta in the façades of our large buildings, and the time seems to have arrived when our architects themselves should show a livelier interest in the matter.

Most of these men have always studied architectural problems in black and white, save when perspective drawings were demanded, and they seem to dread to risk their "splendidly null" line or wash drawings to too close acquaintance with the color-box.

In view of this tendency, would it not be worth while to insist that students of architecture should be obliged to study at least a large proportion of their drawings in color? for in no other way is it possible for them to understand the value of color, or to grow into the habit of thinking in color, which must be acquired before its perfect fruits may be brought forth.

The employment of incrustations and insertions of colored marbles in Venetian palaces are too well known to be described here; and the splendid façades of Italian churches, enriched by color in stone and marble, in mosaic, graffito, fresco, majolica, and terra-cotta, are known and admired by all our students and architects who travel abroad; yet when we look about our American cities, where these gentlemen have designed miles of buildings, costing enormous sums of money, how often do we look in vain for the evidences of the influence of that color sense which imparts so much beauty and character to architecture, especially in the classic and Italian Renaissance styles!

It has often been said that the climatic and atmospheric conditions of the north temperate zone are unfavorable for the employment of exterior color, and that while Greek polychrome may have been effective and harmonious beneath the skies of Attica, the same sort of thing would be quite out of place along our northern Atlantic coast.

It is true that our climate differs from that of Greece, but the difference is greater in degree than in kind; for snow is not at all unknown in Greece, neither is our summer sunlight less brilliant

than that which gilds the shores of the Mediterranean; and for a large portion of the year our climate may be fairly compared with that of Naples during early summer and late autumn.

Besides, what could be more grateful to our Northern eyes than the warmth and richness of real color on our buildings during that season when leaden skies and snow-covered streets bound our vision, and make us long for sunnier climes and cheerier prospects?

Difficulties in the way shrink into insignificance beside the inviting possibilities of success; and it seems to have been rather a question of willingness on the part of architects, than the public, that has thus far deferred an intelligent consideration of this subject.

Our manufacturers of burnt clay are more competent to produce beautiful effects in form and color than any of their predecessors; for, heirs of the ages which have gone before, they have profited by the experience of fellow-craftsmen of the Middle Ages, as well as by the scientific skill which is at their service to-day.

These men are constantly experimenting with new clays, new furnaces, new colors and processes; and nothing short of a personal visit to the kilns themselves will give one any just appreciation of their achievements and the inherent possibilities of a lump of clay.

For exterior work the colors should naturally be fired in the glaze, as applied pigment of any sort is bound to deteriorate in the course of time; and the range of colors for terra-cotta glazes, already known and proven, is astonishingly wide, and embraces practically all those which would be desirable for either interior or exterior work. Reds, ranging from the palest pinks to the deepest madder tints; blues, from faint cerulean to dark indigo; greens, from delicate malachite to olive; yellows, from primrose to stone ochre; exquisite pale mauves, royal purple and velvety black, — a palette fit for a Titian.

Then, as to quality of color, the American terra-cotta maker does not confine his color effects to highly glazed surfaces, for, while these are useful in many cases, they are not always desirable; so, by certain processes, the brilliancy of the glaze may be reduced to a perfectly matt surface, which in texture is more like the patina of fine old bronze than anything else; and when the color also is bronze-like, the effect is very charming.

It is on molded or modeled surfaces, such as capitals, cartouches, friezes, etc., that this treatment is seen at its best, for in the process of reducing the glaze a slight modification of the relief occurs, so that instead of a sort of wire edge being left on the burnt clay, it is softened in a very subtle manner, appearing to have received the faintest "touch of time"; and as the glaze color is practically left untouched in the depressed portions of the work, a charming gradation of tone results, and a texture as of satin renders such a piece as unique as a piece of old Chinese porcelain.

Thus terra-cotta seems to possess more artistic possibilities, and to admit of more variations of form, color, and texture, than any other equally appropriate exterior veneer; and once it is brought into general and rational use, these possibilities will be increased and multiplied through experience and invention.

As to the planning of an exterior color scheme which shall be satisfactory when executed in polychrome terra-cotta, and built up against the sky, much depends upon the architectural character of the building and its environment.

Anything in the way of exuberant color spread over a great surface would hardly be desirable or admissible; and, on the contrary, very diluted tones would be inefficient at a little distance.

It would seem that as horizontal lines are so valuable in a tall façade, that these might best be emphasized by rich colors; and, to carry this point still farther, why should not an entire story or stories be made of a different color or shade of a color from those above or below? Watch a tall gray or white building or tower at sunset, and note how exquisite are the gradations of tint from the rich, rosy glow at the top to the pearly tones at the base; and why is this not a suggestion for possible color treatment?

The walls of certain northern Italian cathedrals and churches are laid up in alternating courses of black and white, or red and white marble and stone; but as this arrangement lacks variety and gives a distinctly "stripy" effect, it has little to commend it to our use.

The Doge's Palace at Venice has a very beautiful checker pattern in pearl and rose carried over its exterior color walls, which has been imitated at various times with conspicuous failure to reproduce the effect of the original; and taking into consideration the probable softening and improvement of the original through atmospheric exposure for centuries, it is not altogether remarkable that the experiments have not been successful.

An English architect, Mr. Butterfield, tried a checker in red and yellowish brick some years ago, at Keble College, Oxford, in a well-meant endeavor to gain richness of exterior color, but the result was anything but happy, as it is entirely out of keeping with its surroundings,— a sufficient reason for its failure; moreover, the colors employed were too strong, and their contrast with each other is too great for harmony.

The Albert Memorial and Natural History Museum at South Kensington, London, are conspicuous British examples of the use of terra-cotta as a constructive material, but may hardly be considered successful from the point of view of color; and in many cities, both at home and abroad, may be seen other examples of the utilitarian value of this material; but its possibilities as a vehicle of architectural and artistic expression, in form and color, have neither been exemplified nor appreciated.

As tall buildings are more often seen in contrast with the sky than with their immediate neighbors, their relation to the sky color is to be considered rather than to that of adjoining and lower structures; and as to what colors shall look best against the sky, we are not without precedent in the successful coloring of certain domes and spires for suggestions.

The green with which old copper roofs so often clothe themselves is always agreeable against the blue sky, and the color of the light yellowish-red Spanish tiles, quite on the opposite side of the color scale, seems to have been invented especially for its value as a foil to the unclouded heavens.

Again, the colors used by the Della Robbias — deep blues, a sort of emerald green, tawny yellow, and a brownish purple with a paler golden yellow — seem to form a complete scale for architectural color composition. In fact all colors may be used in association, provided their values as lights and darks, and the relative surface which they cover, be taken into consideration.

Given the desire for exterior color, or polychrome decoration of large buildings, which undoubtedly exists to-day, there are but two questions to be argued; namely, how much and what colors, and the vehicle or material which is to be colored.

The answer to the first is to be found in the artistic perceptions of those who ask it: as much color and as many colors as may be required to produce a rich and dignified effect.

A description of the walls of the ancient city of Ecbatana, in Persia (from *Enc. Brit.*, 9th Ed., Vol. II., p. 399), which deserve particular mention on account of their being among the earliest examples of constructive coloring on a grand scale, does not seem out of place here, although we are hardly ready for such a gorgeous scheme in America.

"The walls are said to have been 75 ft. broad and 105 ft. high. They were seven in number, one above the other, on the sides of a conical hill, and colored in succession, white, black, scarlet, blue, orange, silver, and the innermost gilt."

Restorations of the great Hall of Xerxes, by Chipiez, show a high cornice with many decorated members, the grounds of these colored in pale yellow, mauve, and blue, with the reliefs accented by touches of stronger value, vermilion, yellow, and rich blue, the whole effect resembling the bloom of an old rug. The frieze of arches from Susa, a full-size reproduction of which may be seen in the Louvre in Paris, shows the figures of men modeled in relief, on a large scale, with the costumes in different tones of yellow, blue, and

mauve against a background of broken blues, the whole having been modeled in clay, colored, and then cut into bricks before firing, after which they were laid up into the wall in accordance with their original positions.

These examples show that the palette is practically unlimited, and that almost any scheme of richness or simplicity may be executed in permanent form.

For interior or protected work the colors need not be "fired in"; but tempera, water-colors, or oil-colors, with gilding, may be used, and thus terra-cotta may receive as elaborate and finished decoration as any other substance.

As to what material is best adapted for polychrome architectural decoration, either external or internal, terra-cotta possesses so many obvious advantages, both utilitarian and artistic, that no other may be favorably compared with it.

One way to go about the study of exterior color is first to visit the kilns where terra-cotta is made, there to study the material itself in its various forms and developments, that its possibilities or restrictions may be properly understood; for there is no more potent influence than that of material on art expression. Observe what has been done, and then make suggestions as to what is desirable in a particular instance.

ON THE SALINE EFFLORESCENCE OF BRICKS.

THE MEANS OF AVOIDANCE.

BY DR. OSCAR GERLACH (PH. D., BERLIN).

I NOW pass to the part of my subject which is concerned with the avoidance of efflorescences, and for the sake of clearness I shall briefly recapitulate the modes of origin, taking up the means of avoidance in connection with each separately.

WHITE EFFLORESCENCES.

Sources.—I. *The Green Clay.*

1. Caused by the antecedent presence of sulphates in the clay.
2. Caused by the formation of sulphates during the storage of the clay.

Sources.—II. *The Manufacturing.*

1. During molding.
   - *a.* Caused by the presence of sulphates in the water or coloring matter.
   - *b.* Caused by the formation of sulphates during drying.
2. During burning.
   - *a.* Caused by the water-smoking.
   - *b.* Caused during burning.

Sources.—III. *Environment of the Bricks and Buildings.*

1. Caused by the absorption of saline solutions from the soil of the place of storage.
2. Caused by the absorption of soluble salts from the soil on which the building stands.

YELLOW AND GREEN EFFLORESCENCES.

1. Organic in character — caused by the action of vegetable micro-organisms.
2. Inorganic in character — caused by soluble vanadiate salts.

Source I. *The Green Clay.* The quantity of sulphates antecedently present in the clay is usually not very large, but 0.1 to 0.05 per cent. is quite sufficient to impart to the product an annoying white incrustation. To prevent this efflorescence, the soluble salts must be converted into insoluble by the addition of appropriate chemicals. The most effective and the most economical are the barium compounds, and particularly carbonate of barium and chloride of barium. Barium salts possess a strong affinity for sulphuric acid. When barium salts come into contact with sulphates, an immediate transformation takes place, the sulphuric acid combining with the barytes to form sulphate of barium — a combination absolutely insoluble in water. Expressed in chemical formulæ, the transformation of the calcium sulphate with the barium compound above mentioned is as follows: —

Sulphate of Calcium		Carbonate of Barium		Carbonate of Calcium		Sulphate of Barium
$CaSO_4$	+	$BaCO_3$	=	$CaCO_3$	+	$BaSO_4$
Sulphate of Calcium		**Chloride of Barium**		**Chloride of Calcium**		**Sulphate of Barium**
$CaSO_4$	+	$BaCl_2$	=	$CaCl_2$	+	$BaSO_4$

In both cases the sulphuric acid is transferred to compounds that are insoluble in water, and so is absolutely incapacitated from producing the injurious incrustations. If these salts are easily and cheaply had, it is indifferent which of them the manufacturer employs; but if they have to be brought from a distance, it is more economical to employ the chloride of barium. The reason of this is plain, from the chemical nature of the salts.

MODE OF EMPLOYING CARBONATE OF BARIUM.

We shall first take up the carbonate. Carbonate of barium is insoluble in water. To procure a uniform effect, therefore, the salt must be mixed with the clay very thoroughly and in as finely powdered a form as possible, because the transformation of the soluble sulphates takes place only where the two salts come into immediate contact with each other. The amount required is relatively very small. But since it is difficult to mix small quantities with the requisite thoroughness, a large excess of carbonate of barium should be employed, say from ten to twenty times the amount which is theoretically sufficient, in order to ensure the conversion of all the soluble sulphates into insoluble salts of barium. The excess of carbonate of barium is not injurious, since it is absolutely insoluble in water.

I will now give examples of how the matter is to be carried out in practice.

First, the clay must be analyzed and the amount of sulphates in it determined. Analyses of the kind in question are best made in a special laboratory. Let us suppose the clay contains 0.1 per cent. of calcium sulphate ($CaSO_4$). One kilogram of dry clay contains 1 gram of calcium sulphate. One English pound contains 0.455 gram. One gram calcium sulphate requires, according to the formula, for perfect conversion into barium sulphate, 1.45 grams of carbonate of barium. Hence, theoretically, for 1 kilogram of clay, 1.45 grams of barium carbonate, or for one English pound of clay, 0.66 gram of barium carbonate, must be used. Since, now, for the reasons stated above, ten times the amount theoretically required must be employed, therefore 6.6 grams barium carbonate must be used for every pound of clay. Supposing the green brick weighs 7 lbs., then for one brick 46.2 grams, or for a thousand bricks 46.2 kilograms, or 101.6 English pounds, would be required. A pound of barium carbonate costs 2½ cents. Therefore, for a thousand bricks an extra outlay of $2.50 would be necessary.

Much cheaper is the process if chloride of barium be employed, for here the transformation takes place instantly and more energetically. This salt is readily soluble in water, and in its dissolved condition is uniformly absorbed by the clay particles, so producing an immediate transformation of the soluble sulphates into insoluble. Whilst the carbonate of barium must be used in considerable excess, in employing the chloride of barium it is advisable to keep as closely as possible to the theoretical limit, because too great an excess is quite apt to cause a re-crystallization of the chloride of barium on the surface of the brick, and so to give rise to other incrustations.

THE EMPLOYMENT OF CHLORIDE OF BARIUM.

We use the same clay as before; namely, a clay containing 0.1 per cent. sulphate of calcium. One gram of calcium sulphate requires theoretically 1.8 grams of crystallized chloride of barium ($BaCl_2 + 2\ H_2O$). One kilogram of clay containing 0.1 per cent. sul-

phate of calcium requires, therefore, 1.8 grams chloride of barium, one English pound requires 0.82 gram chloride of barium.

Supposing, now, the green brick weighs seven English pounds, then one brick would take 5.74 grams, and a thousand bricks would take 5.74 kilograms barium chloride. If barium chloride costs 2½ cents a pound, a thousand bricks, therefore, would require an extra outlay of only 32 cents.

In using barium chloride, chloride of calcium is produced as a collateral product; but this has no injurious effect, since it is readily decomposed at red heat into oxide of calcium, and as such acts as a flux.

In like manner, the coloring matter and the water used should be analyzed for their sulphur, and treated accordingly with barium chloride.

Source II. Manufacturing. If the clay, treated as above indicated with chloride of barium, be used at once, no coloring will be noticeable either on the surface of the unburnt or on the surface of the burnt brick; but if the clay as thus treated be allowed to lie for any length of time, new quantities of iron pyrites will be converted under the influences of weathering into sulphates, and so fresh additions of the chloride will be necessary. If the clay has been made into green brick, the process of drying should be accomplished as quickly as possible, to prevent the subsequent accumulation of sulphates on the surface. On the other hand, quick drying prevents the deposition of possible other salts which are present, on the surface of the products. In general the deposition takes place here preferably in the interior.

It has often been observed that bricks manufactured from sulphurous clays, which come absolutely uncolored from the kiln, afterwards show distinct colorations. This is largely due to the drying. The evaporation of the water takes place in most part on the surface, and most energetically at the places which are most exposed to the draught. And so the incrustations are first and most commonly found on the edges of the product, whilst the spots where the bricks rest upon one another, and where, consequently, no evaporation can take place outwardly, are quite free from colorings. The more quickly the evaporation of the water is effected the less will be the quantity of salts visible on the surface. This is explainable from the following consideration.

The water in the interior of the bricks must ascend through the fine pores to the outer surfaces. If the water ascends slowly through the pores, occasion is given for its saturating itself thoroughly with the soluble salts and so carrying them to the surface.

The phenomenon admits also of another explanation. As stated above, and owing to capillarity, — that property in virtue of which fluids rise by attraction on the walls of minute tubes, — the evaporation of the water takes place mostly on the outer surfaces of the bricks, which constitute a system of fine tubes. Now it is a familiar fact of physical chemistry that very many saline solutions do not rise uniformly and unaltered through such systems, but that they are separated in such a process into pure water and a concentrated solution of the salt. The water hastens in advance of the salt,— and the more quickly, according as the ascent is rapid, or according as the brick is more porous, or according as the evaporation of the water is accelerated at the surface. The pure water will thus first reach the surface and be evaporated there, while the saline solution will be kept back in the interior of the brick, where it will gradually be deposited if no more water is present to dissolve it; but if the progress of the water be slow, the saline solution will reach the surface with it and be deposited there.

The incrustations, therefore, which appear during drying are found more frequently on bricks which are made from oily (plastic) clays than on bricks made from relatively non-plastic or sandy clays. In the former the porous system is considerably restricted, the orifices are smaller, and the water has more obstacles to encounter in reaching the surface. In the latter, — in bricks made from sandy clays, — owing to the greater porosity, the evaporation takes place more energetically, and not only at the surface, but also partly in the interior: first, because the interstices are here much larger; and secondly, because the sand prevents the perfect closure of the pores. This is why the smooth surfaces of pressed brick show the saline efflorescences more than the rough surfaces. By the action of the press the lateral surfaces of the brick acquire a denser structure than the upper and under surfaces. And also in ejection from the press, owing to the friction between the plastic brick and the sides of the form, these same lateral surfaces are still more densely compressed. By this compression the escape of the water is obstructed; consequently, because of its evaporating slowly and gradually, the water carries all the dissolved saline components to the smooth surface, where they are more readily rendered visible than on the rough surface, where, owing to the magnitude of the porous orifices, a partial evaporation of the water, and therefore also a deposition of the salts, occur in the interior.

There is a kindred annoying phenomenon which makes its appearance principally on the rough surfaces of the bricks, when the impressions of the workingmen's hands become visible. Frequently, after burning, certain spots are found colored white, while the remainder of the brick exhibits the normal, desired color. These are the spots at which the brick has been subjected to the pressure of the workingman's hand.

From what has gone before, an explanation for this readily suggests itself. By the pressure of the workman's hand, which is always more or less moist, the pores of the brick are closed at these spots, and the spots themselves made smooth. In consequence of the slower evaporation of the water here, the salts will be deposited at these places first, and the deposition will be rapidly augmented by the constant crystallization at these points of the saline water of the environment.

Another explanation is the following: During drying, salts come to the rough surface of the brick, but owing to the roughness of the same are not visible to the eye. If, now, by the pressure of the workingman's hand these places are flattened, and the minute saline particles crushed, the white coloration will be much more noticeable at these spots than at the remainder of the surface. An illustration will explain my meaning.

Imagine a very large number of minute particles of chalk on a slate or blackboard, and about a millimeter apart from one another. The original color of the board will not be destroyed by the particles. A short distance away, the dark coloring of the board alone will be noticeable; but if we stroke the board lightly with our moist finger, the soft particles of chalk will be crushed and pressed into the granular surface, so obliterating the dark coloring, and rendering the white path of the finger distinctly visible.

ETERNAL vigilance is the price of safety. Wherever a building, or any part thereof, has once come to grief under stress of attack by fire and water, there is proof of the existence of something which demands remedy at the hands of those interested in the development of fire-resisting construction, whose constant aim should be to increase protection and to diminish exposure. The latter is as important as the former. There are too many whose professions of confidence in the efficiency of protective appliances are such as to lead to contempt of danger, and therefore to neglect of such simple measures as guarding against exposures from without by the application of shutters, as the subdivision of space by fire walls, as the use of automatic sprinklers, and whose confidence in the value of fire-protective coverings is so great as to encourage carelessness in their design and application.

That branch of the fire-proofing industries will achieve the greatest success which is most suspicious of the efficiency of its own products, and, therefore, takes greatest pains to bring about improvement in their design, manufacture, and application. Whatever is pronounced by its makers to be "good enough" is sure to be crowded out of the market by those makers who never consider anything which they have done "good enough." If those interested in the manufacture and application of burnt-clay fire-proofing materials will work in this spirit their position will become impregnable.

Fire-proofing.

SOME NOTES UPON THE STRUGGLE FOR SURVIVAL BETWEEN BURNT-CLAY FIRE-PROOFING AND ITS NEWLY ARISEN RIVALS.

(*Concluded.*)

BY DANKMAR ADLER.

SUPPOSE that the architect of the Club House of the Chicago Athletic Association had given more thought to the fire protection of its pillars and less to their ornate wooden enclosures; suppose that the pillars, the girders, and the bottom flanges of the floor beams in the Western Union Building had had protective covering; or suppose that the enormous glass exposures of the Horne Building had had the protection of iron shutters; suppose its floor acreage had been divided by a good fire wall; suppose that a very little attention had been given to the support of its water tanks and to the fire-proofing of the supports. Even if all these things had been attended to as they should have been, even then there would have remained a certain defect inherent to the present methods of manufacture and application of clay fire-proofing material.

I refer to a tendency to break, under stress of exposure to alternations of intense heat with the cooling effect of the application of water, which has been observed at the lines of intersection of face and return members of hollow-tile blocks. This tendency has shown its greatest development at exposed corners, such as are formed by the coverings of beams projecting below the general ceiling surfaces of hollow-tile floor arches, or by the angles of pilasters formed where column coverings project from the faces of hollow-tile partitions and walls, also at the jambs of doors and windows, and still more so at the corners of rectangular coverings of free-standing pillars, even where such corners are rounded. Then there is the tendency of the bottom flange of hollow-tile arches, under stress of alternating heating and cooling, to crack away from the web members, which, if the arches are of the side-web type, cause their destruction; while in the case of end-web arches, while the arch generally maintains its integrity, the ceiling is apt to be lost.

The writer has enjoyed opportunities, in buildings erected under his professional charge, for noting the behavior of burnt-clay fire-proofing materials. These observations have demonstrated quite clearly the great value of burnt clay as a fire-protection covering for the structural members of buildings, but also call attention to the necessity for eliminating the danger which lies in the existence of an inelastic and brittle connection between face and return members of hollow-tile blocks. There is enough difference in the behavior of the protective material, under exposure to fire and water under different conditions of varying methods of application, to point the way to the corrective and remedial measures, which, however, are not stated as being finalities. Further study of the subject may develop other and more valuable suggestions. It is hoped that every one who has made or applied burnt-clay fire-proofing material, or who is in any manner interested in any building in which the same has been used, will make a study of this subject and observe and report upon occurrences like the following at every possible occasion.

Among the buildings under my observation, the Auditorium at Chicago is foremost. Its fire-proofing material is hollow tile made of porous terra-cotta, the webs being quite thick, to the best of my recollection fully 1 in. if not more. Ordinary brick clay was used, and the tiles were not burnt very hard. I remember five different fires in the building. The first, during construction, in a large unfinished room used for storing empty glass boxes, which, being filled with straw, made an exceedingly hot blaze, but caused no damage to the building other than breaking glass and burning window frames and sashes. In the completed building there were two similar fires, each of which burned up the combustible contents of a room, but caused no further damage. There were also two fires in the basement kitchen, where the accidental spilling of grease upon hot ranges set fire to the insulating covering of electric cables carried on the ceiling near by, and these in their turn caused ignition of wooden shelves, cupboards, etc. But no damage was done in either case to the structural members of the building. The writer ascribes the excellent behavior of the fire-proofing in this building to the fact that in the places where the fires occurred there were no angles exposed to irregular expansive and contractive action. The pillars were round and the coverings followed the curves of the metal; the ceilings were flush, and, above all things, the tile was thick. It had been made before the day of the theory that good building is synonymous with approximation to the condition of the captive balloon.

In the Schiller Building, at Chicago, there were two fires originating in the restaurant kitchen, as in the Auditorium, from hot grease spilled into range fires, but which also, like the corresponding fires in the Auditorium, left the structural framework and its coverings uninjured; and there was another fire which attacked the Schiller Building from without, beating upon the enclosing walls of the large court, which were formed of two thicknesses of 4 in. hollow burnt-clay tile blocks. A very fierce fire having arisen in a building about thirty feet away, the intensity of the heat was such as to break all the glass and burn the frames and sashes in the exposed court wall of the Schiller Building, and also to break the glass and burn the paint off the doors and windows in corridors and rooms inside of the building, and from sixteen to twenty-two feet distant from the exposed court wall. The floor and partition construction of the Schiller Building escaped injury, but the enclosing walls of the court were seriously damaged. The outer webs of most of the tiles fell off, particularly at the jambs of the windows, but enough remained intact that the structural steel members of the building escaped injury. The effect of the fire was the same as that observed at the Athletic Association Building, and was quite a vivid illustration of the chief, if not the only weakness of the hollow-clay tile as a fire-protective covering. There were breaks at the lines of junction with return webs in almost every hollow-tile surface exposed to the joint action of hot fire and cold water.

A reasonable inference to be drawn from these observations is, that it is necessary to so form and apply the burnt-clay tiles as to allow for free movement in sympathy with the changes of dimension caused by the action of fire and water, and yet exclude the fire from access to pillars and beams.

I shall cite two instances where this has apparently been accomplished. Both the buildings referred to have wooden joists resting on steel girders, which in turn are supported by round, cast-iron pillars.

In case of one of these, built for Mr. Martin Ryerson, at the northeast corner of Wabash Avenue and Adams Street, at Chicago, the protective material used consisted of solid blocks of porous (fire clay) terra-cotta applied to the pillars and girders and to the under side of joists, while the tops of the joists were protected by a mortar deafening 2 ins. thick. The upper story of this building was used as a manufactory of straw hats, and was filled over its entire surface and almost to its entire height with shelves and racks containing straw braid, and straw hats in various stages of manufacture. The dimensions of the place were 110 by 170 by 16 ft. The building was struck by lightning, and the shelving, racks, straw braid, and hats in the top story consumed by fire. The damage done the building consisted of breakage of glass, burning of window frames and sashes, the burning of a considerable area of floor boards, the partial burning of the 2 by 4 in. strips to which the floor boards had been nailed, the strips having been imbedded in mortar. The plastering was but slightly damaged, as its hold upon the porous terra-cotta was such as to prevent its falling off. This seems to me one of the most severe tests to which fire-proofing material was ever subjected in a building.

It is my belief that the changes of dimension induced by the action of fire and water were taken up in the small air cells of the porous terra-cotta. It is also to be noted that the column covering was circular, and therefore did not prevent any angles for breakage by reason of expansion and contraction.

In another building of Mr. Ryerson's, in which also there were wooden joists, steel beams, and cast-iron columns, the fire-proofing for the joists was made of hard tile, "book tiles" split in half. There was quite a hot fire in this building, then used for storage of wall paper, which fire was also confined to the story in which it had originated, and which also did not feaze either the fire-proofing material or the structural members protected by it. Here the ceiling tiles, which were split book tiles, and practically without return webs, had been so applied as to allow a little lateral motion; and although the fire was quite hot and the water was freely used, the tiles passed through the fire intact and free from cracks. Here, also, the column coverings were circular in plan.

Summarizing the results of these observations of the action of fire upon various forms of fire-proofing material, and noting, also, the published accounts of the conduct of such materials in fires in other buildings, and giving due heed to the published reports of various special tests, I cannot escape the conclusion that the side-web tile arch should not be used at all, even if there is a special protection for its soffit. Such protective covering should, however, always be used, and may be designed upon lines similar to those adopted for the ceiling construction under concrete arches, as, for instance, used by me in the Wainwright Building, of St. Louis, where there is a suspended ceiling of burnt tile (book tile) below a system of concrete arches of large span. While where the end-pressure arch is used protection for the soffit may not be essential to the safety of the arch, yet if it has an independently suspended ceiling that will not come to grief, but will yield to expansion and contraction, as was the case in the Ryerson Buildings quoted above, and therefore its use is advisable. Column coverings should always be made circular in plan. Jambs should be formed of solid blocks of porous terra-cotta, and not of hollow tile.

These changes in current methods suggest themselves to me. Many others, perhaps more valuable, will occur to those more conversant than I with processes of manufacture. Still, when all has been considered, it seems strange how little may have to be done to enable the burnt-clay tile to maintain the claim of its makers, that it is the best fire-proofing material available for ordinary building construction. The modifications of current practise need not be many, but whenever found necessary they must be made. Therefore, I repeat that the side-pressure arch must go, as must also the rectangular column covering with and without rounded corners, unless it be made of solid blocks of porous terra-cotta. The hollow-tile jamb block must be abandoned and solid porous terra-cotta blocks used in its place. While some modification of the form of wall and partition tiles is necessary in order to avoid the cracking away of face from return members, I am not sufficiently familiar with the processes and possibilities of tile manufacture to feel qualified to make any suggestion, but I hope that tile makers may find a simple and effective solution. In making these, as well as all other forms of tiles used in fire retardent construction, strength must be sought for in preference to lightness.

Those interested in the manufacture of clay fire-proofing materials owe it to themselves and to the community which they serve, that they abandon the claim that there is any protective covering which can make a building really fire-proof, or even reasonably fire retardent, unless it is used and applied with ordinary good judgment. It must always be remembered that the hollow-tile arch and the clay column and beam covering will not increase the fire-resisting qualities of glass, and that to leave a single heavily loaded beam or pillar unprotected or inadequately protected may cause the collapse, not merely of this particular unprotected member, but also of large areas of floor and wall resting upon beams connected with it by means of bolts and rivets.

Mortar and Concrete.

HYDRAULIC CEMENTS.

BY CLIFFORD RICHARDSON.

FINISHED CEMENT.

THE best Portland cement is a light gray or neutral tint, with a tinge of yellow and green, and a specific gravity of about 3.15. If the color approaches too nearly white, or is too dark, or has too yellowish a tinge, the burning or composition is at fault. The best Portlands vary somewhat in shade, depending on the amount of iron oxide present, but all have a similar color and one which is characteristic of good cements, and not at all like that of slag or hard-burned natural cement.

If the burning is not satisfactorily carried out the specific gravity of the cement will vary from the normal, as will the volume weight or density, although the latter is also affected by the degree of fineness to which grinding has been carried and the length of time the cement has been stored. The most thoroughly burned Portland cement has a specific gravity of about 3.15, never below 3.10, and rarely above 3.18, at 60 degs. Fahr. At higher temperatures it is relatively less, and for a number of brands recently examined the following results were obtained: —

Brand.	Specific Gravity at 78 degs. Fahr.	Specific Gravity at 60 degs. Fahr.
Germania	3.078	3.175
Alsen	3.079	
Vulcanite	3.036	
Black Eagle	3.075	
Belgians	2.924–3.013	
Sand Cement	2.757	

The best Portland cement should be so fine that not more than 25 per cent. will fail to pass a two hundred mesh sieve, 10 per cent. a hundred mesh, and none a fifty mesh sieve. Coarser cement should command a smaller price, as the amount of sand that can be safely mixed with it is largely dependent on its fineness. It has been found by Le Chatelier that particles larger than those which will pass an ordinary sieve of one hundred and twenty meshes to the linear inch are of little hydraulic value, being slowly decomposed and hydrated, and then not entirely even after a long time. Cement having a specific gravity of less than 3.10 should be looked upon with suspicion. When of normal character of fineness and gravity the volume weight per cubic foot is between 100 and 108 lbs., as packed in barrels commercially, as compared to the 65 to 80 lbs. which natural cement weighs.

SETTING.

Portland cement, and in a similar way natural cement, when mixed with water to a paste, in the form of mortar, becomes hard on standing, or sets. This is the result of a chemical reaction in which water takes an essential part, as it will be found that cements will not harden or set with any liquid which does not contain it. According to the most reasonable theory water plays two parts in the process: in one decomposing the original compounds of the cement and acting as a solvent for the products of their decomposition; in the other combining with these products to form new hydrated crystalline solids which, in their formation and crystallization from the watery solution, bind themselves and the mass together, bringing about the result called setting. The original substances of which cements are composed are, in Portland cements, very basic compounds of lime, with silica and alumina, or iron, which are easily decomposed by water with the liberation of lime and the formation of the hydrated compounds. On the decomposition of the aluminates of lime, when Portland cements are mixed with water, free lime is liberated, and, if the cement is not immersed in water, soon begins to crystallize out in the mass in the form of plates of calcium hydrate, which can be observed under the microscope. If the cement is then, or later, im-

mersed in water, this free lime is gradually dissolved out, and may be detected by the soapy or alkaline feeling which a limited volume has in which the cement is placed. It is also noticed, where cement concrete is placed in water, the volume of which is limited, as a pellicle of calcium carbonate which forms on the surface under these conditions.

This solvent action might go on indefinitely were it not for the density of Portland cement mortar, and unless, as is claimed, the action of carbonic acid of the air or water put an end to it and exercised an important influence in the hardening of cement. At the same time, if there are salts in the water which attack carbonates, no protection can be gained in this way. It is unlikely that there is any lime actually free in a high-grade Portland cement, this being distinctly characteristic of the natural cements, but rather that, in those containing a high percentage of lime, it is in such a state of combination with alumina as to be more rapidly liberated with the evolution of heat in the presence of water than would be the case if there were less of it, or if it were stably combined with silica by harder burning. In fact, it is found that the larger the percentage of lime a cement has the more care must be given to the burning, and the higher and longer the temperature must be in order to bring about the entire combination of the lime in forms which shall not be too rapidly hydrated by water. The calcium aluminate, which has been decomposed by the water with liberation of lime, is the cause of the first or initial set of Portland cement, the less basic aluminate becoming hydrated and crystalline. The nature of the set, whether quick or slow, depends on the amount and basicity of the aluminates; and, as has been shown, when there is too large a portion of aluminates, or too basic ones, the set is fiery. The basic silicates of lime are decomposed more slowly than the aluminates, and contribute chiefly to the hardening of the cement or mortar, as shown by the Newberrys. Portland cement forcibly burned and ground usually sets very rapidly and often becomes heated on mixing with water. For example, 10 ozs. of new cememt mixed with 20 per cent. of water at ordinary room temperature, balled up very much, heated, and on immersion of a thermometer in the mortar an elevation of 23 degs. Fahr. was observed. Such cement is, of course, unsuitable for ordinary use, as it cannot be well mixed and put in place before setting.

If the cement is left exposed to the air and in storage for some weeks it will be found to set slowly, having in the meantime become, to a certain degree, hydrated. It is customary, therefore, to store cement for some time before putting it on the market, but where this is not convenient, a similar result can be brought about in another way. It has been found that burned gypsum or plaster, when added in small amount to very rapid setting cement, has the effect of reducing the set to normal. No more than 1 or 2 per cent. is required for this purpose. Its use is not considered out of the way, and it is a common practise with most manufacturers both abroad and at home. Its action is supposed to be due to the fact that it combines with the basic aluminate of lime and prevents its too rapid decomposition and hydration. If plaster is used in excess, however, it is claimed that it has an injurious effect, especially in the presence of sea water. Portland cement should not set, at ordinary temperatures, in less than an hour, except in particular cases where it may be necessary to use it in presence of water. This slow set is one of the features which distinguishes it from the quick-setting natural cements.

When subjected to cold it will be found that the setting of both kinds of cements is much delayed, and at a freezing temperature will be prevented under any conditions, whereas heat may be made to produce as much effect in a short time as would require weeks at ordinary temperatures. Portland cement will, however, act much more satisfactorily in cold weather than natural, and will eventually attain a satisfactory strength very often where the latter crumbles, especially if once it has attained its natural strength.

Hardening of Cement. Beyond the mere preliminary act of setting or becoming firm there is a change in cement which goes on for a long time, accompanied usually by a continued increase of strength. It may be described as hardening. It involves chemical changes and the rearrangement of the elements of the cement, depending on the action of water and carbonic acid on its constituents. Much water and some carbonic acid enter into combination with the silicates and aluminates. For example, at different ages after being made up and kept in water neat briquettes of an American Portland cement, after being taken from the water and dried at 212 degs. Fahr., contained the following amounts of water and carbonic acid: —

	H_2O	CO_2	H_2O Free.
1 day test	5.06%	1.92%	2.02%
7 „ „	6.47	2.79	2.88
28 „ „	7.94	2.36	2.56

It appears that with Portland cement a relatively small amount of water is present and necessary for the set of the cement, but that with age water plays a prominent part in the real hardening process, while carbonic acid is of minor importance.

SETTING OF NATURAL CEMENTS.

The process of setting with natural cements is somewhat different from the comparatively simple one with Portland cements because of the presence of the caustic alkaline earths, lime and magnesia, their carbonates and undecomposed silicates, all of which enter more or less into the reaction. The aluminates, here as with Portland cements, probably produce the principal phenomena connected with the initial set, but the presence of free lime has generally a tendency to make all natural cements heat on mixing with water. Few natural cements are burned to such a degree as to remove all carbonates, and what are left seem to be capable of developing some very decided hydraulic properties with the free alkaline earths. Utica and Akron cements, which are but lightly burned, illustrate this fact.

In the final hardening, also, the undecomposed silicates very likely play the part of a puzzolana, while it is questionable whether any tricalcic silicates exist in natural cements, although a large portion of the silicates have been decomposed in burning with the formation of aluminates. We are, unfortunately, not in a position to explain the setting of natural cement as well as that of Portlands.

Further Comparison of Portland and Natural Cements. The relative proportions of water and carbonic acid present in Portland cement mortar of different ages when immersed in water has been commented on.

In the case of natural cements at early stages the amount of carbonic acid, derived largely from that not driven out of the original carbonates in burning, may exceed that of the combined water, a Cumberland briquette at the age of seven days having 9.23 Co_2–6.07 H_2O, but the relative changes with age and the acquisition of water of hydration is much more rapid than that of carbonic acid. After very long periods of time, and especially with exposure to the air, the amount of carbonic acid may increase relatively, although the increase is slow, as in the case of ordinary lime mortar. The importance of any carbonic acid found in a natural cement some time after use is, therefore, to be attributed quite as much to its original origin in the carbonates of the cement stone as to its gain in setting.

(*Continued.*)

IN the United States there are now thirty factories making cement, the output being 2,250,000 barrels annually. This industry has been almost entirely developed within the last ten years, and the greatest development has been in Pennsylvania, where the limestone is almost free from magnesia and makes a cement equal in every respect to the imported article. The country is now producing nearly as many barrels of cement a year as were imported in 1895. While the imports have not greatly increased, the home product of Portland cement has steadily grown from 454,813 barrels in 1891, 547,440 barrels in 1892, 590,652 barrels in 1893, 798,757 barrels in 1894, to 990,324 barrels in 1895, and of this quantity Pennsylvania produced more than one half. — *Philadelphia Enquirer.*

Masons' Department.

REGULATING COMPETITION — METHODS OF ESTIMATING.

BY F. E. KIDDER.

ONE of the great problems, if not the greatest problem that confronts brick contractors in many localities to-day, is to provide some lawful means of regulating competition so that there shall not be such a variation in the "brick bids" as now prevails, and so that when bids are opened one or more shall seldom be found to be so low as to preclude any possibility of a fair profit, or of doing the work as it should be done, without the contractor "going into his pocket" to pay for a part of it.

In some of the older and larger cities contractors have arrived at an understanding or agreement whereby work that is let from architects' offices goes at a figure that will give some profit if the job is wisely managed; but in many cities no such agreement exists, or if there is one, it is not kept, and the large number of would-be contractors constantly importuning architects and owners for an opportunity to figure, to say nothing of the peddling of bids by general contractors, makes the difficulty of getting a fair price still greater.

In Denver, and probably in many other Western cities, competition has been so close during the last five years that nine tenths of the building contracts have been made at figures which, after all bills were paid, barely left journeyman's wages for the contractor, and too often nothing at all. If low bidding only injured the party directly involved, it would not be a matter of general interest; but so long as it is a common custom to let the work to the lowest responsible bidder, this evil prevents those who make fair and reasonable bids from securing a contract. If a contractor wished to do good, honest work, and make, say, 5 per cent. on the contract, it has been in many cases hardly worth while to put in a bid.

Now, how can this bidding below a living profit be prevented?

One method is by means of a close association having an arrangement with the material dealers by which "outsiders" cannot procure material, and an understanding amongst its members that work shall be figured on a certain basis. This method has been made to work fairly well in some localities, but it involves some injustice, and has the nature of a "combine" which prejudices the building public against it.

The brick contractors of Denver undertook, at the beginning of the present year, to have all brick bids opened in the rooms of their association before they were handed to the architect. Extreme low or high bids were thrown out, and an average taken of the others, and 3 per cent. added to defray the association expenses. This final sum was then to be the lowest bid submitted, and the party whose original bid was nearest to this average bid was chosen to put in the low bid fixed upon. Those whose bids were above the average handed to the architect their original bid, while those whose bids were below made out new ones, so that when the bids were opened by the architect, they had all of the appearance of an open competition. A method of taking the average of the bids within certain limits would perhaps not be unjust, as the average bid is probably, in most cases, about what should be received for the work; but the particular method pursued in Denver seemed to the architects there false and unfair, and they denounced it publicly, so that it has been abolished, after having been in force for about three months.

There are other methods, looking to limiting the number of competitors, which have been tried and advocated with more or less success, but so long as there are more contractors than there are contracts to be let, it will always be more or less difficult for contractors to get a fair price for their work. The writer believes that one reason why bids are often much too low is, that the contractor does not take off the quantities correctly, or does not know, within reasonable limits, what the work will cost him. An honest contractor is not very likely to put in a bid that he knows will allow him no profit, and bids from dishonest contractors should not be accepted. In the opinion of the writer, therefore, a correct system of taking off the quantities whereby the exact cost of the labor and materials can be very closely computed is of the first importance, and if such a system were generally followed, the bids would run very close wherever a fixed standard of wages prevails.

Another advantage of a general system of estimating is that the architect can also easily take off the quantities, and figure the cost with reasonable accuracy, thus enabling him to determine beforehand about what the cost will be and what the work is worth.

After all of these years of intelligent building, contractors' associations, conventions, etc., it would seem that so simple a matter as estimating plain brickwork would have been reduced to a fixed and accurate system, or rule, long ago, but it has not, and perhaps may never be.

It is true that individual contractors can and do estimate very closely the probable cost of labor and materials, but a great many follow a very simple rule which gives neither the exact quantity of brick nor takes into account the character of the building, so that the price based upon it is largely, after all, a matter of guess work, and it is not to be wondered at that some needy contractors guess as low as they dare. In a succeeding paper a comparison will be made of different systems of estimating, with a view of showing the most accurate.

LAYING BRICKS IN COLD WEATHER.

THE composition of mortar which can be used to lay bricks in freezing weather without risk of destruction of the set of the mortar is a subject which affords a fertile opportunity for space fillers and technical journals.— we know, for we have tried it ourselves,— and yet there is a common-sense view of looking at it which ought to settle it at once, namely, that if first-class work is expected, we ought no more to expect to be able to lay bricks in freezing weather than we would to wear pajamas at Christmas. One of the curses of modern construction is the assumed necessity for haste. Our architects and constructors ought to be willing to look at it in the light of common sense, and admit that it is impossible to successfully lay any kind of masonry in freezing weather without running so great a risk of a poor resulting construction that they had a great deal better wait until the mercury goes up. This would solve once and for all the question of how the mortar should be composed. If we want first-class work we must have first-class conditions, and these simply do not exist when the thermometer is below 32 degs.

ENAMELED BRICK.

THE economic advantages of using enameled brick for elevator wells, engine and boiler rooms, and cellars is thoroughly appreciated by all who have had the management and care of a large commercial building, but is not always patent to those who are having their first experience with such investments. The extra cost of enameled brick is considerable, if good brick is used, and we should be sorry to recommend anything but the best. The advantages, however, more than offset the extra cost in the long run. Enameled brick is a non-conductor of heat and moisture, the surface is not easily abraded, and consequently preserves its appearance intact indefinitely, it is a light reflector, and all these qualities combine to discourage dirt, which is the most expensive and troublesome factor of a large building. If the byways of a big office building can be kept immaculate, the machinery will last longer, the character of the building be higher, it will be easier to rent rooms, and the temper of the attendants will be much more livable. Now, enameled brick does not directly do all this; but on the same principle that an electric arc light on the street is the best kind of policeman, so the bright, light appearance of an enameled surface is a discourager of shiftlessness, carelessness, and dirt, and to that extent warrants all the extra cost of even the best manufacture.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.— No doubt readers of THE BRICKBUILDER who follow closely the reports of building operations in New York will be interested in comparing the report of this month's doings with that of the corresponding month of 1897. The greatest and most noticeable difference is in the falling off of the number of projected new office buildings in the business section of the city; and as these buildings are of great importance, involving a great expenditure of money, and affecting largely brick and terra-cotta interests, an inquiry into the cause of this falling will be of interest.

First, the continuance of our war with Spain is partly responsible, but not as largely as might be imagined, as reports from Wall Street show a healthy and confident condition, and money to loan on easy terms.

Last year at this time lower New York looked as though it had suffered from the effects of a bombardment (not from a Spanish source, however, for they would not have struck anything), and to visitors must have presented an odd appearance. This was on account of the unusually large number of buildings on prominent corners that were being torn down to make room for new and more ambitious structures. In place of these old buildings we now have the new Empire Building, Exchange Court, Hudson Building, Washington Life, Singer Building, and the still unfinished Park Row Building, the tallest office building in the world. The only large office building in process of construction on Broadway now is the Cheseborough Building, Clinton & Russell, architects.



BAYARD BUILDING, BLEECKER STREET, NEW YORK CITY.

Louis H. Sullivan, Lyndon P. Smith, } Associated Architects.

The front of building is of terra-cotta, executed by the Perth Amboy Terra-Cotta Company.

Investors have continually been warned by conservative people that they were supplying offices far in excess of the demand, but few thought that the excess would be great enough to make any serious break in rentals. The craze for sky-scrapers has been at its height for the past three years, gradually diminishing as the truth was enforced that, under modern methods of construction and with the enormous capital available for the purpose, offices could be created, and were created, at twice the speed that the need of them actually grew, even in good times.



SOFFIT PANEL, MAIN CORNICE, BAYARD BUILDING.

Speculators are realizing that sky-scrapers are not the good speculative operations of which they had dreamed. It may be expected, therefore, that the sky-scrapers of the future will be those that are erected not merely for profit, but from some other reasons; that they may be built by strong estates or by great corporations, the former looking for very small interest upon a moderate value for their land, and the latter seeking that unnamed but substantial advantage which is derived from having an imposing home; and thus, in course of time, will rentals right themselves as the business of the city grows up to the offices now at its disposal.

The next monthly meeting and dinner of the Architectural League will be unusually interesting, as it will be held in Havemeyer Hall, Columbia University, and, through the courtesy of Professor Ware, the members will have an opportunity to inspect the new and interesting group of buildings designed by Messrs. McKim, Mead & White.

Some of the more important items of new work are:—

Jeremiah O'Rourke & Son, architects, of Newark, have planned a thirteen-story brick and limestone apartment hotel, to be erected at Fifth Avenue and 45th Street; cost, $750,000.

McKim, Mead & White, architects, are at work on plans for a residence to be built on the corner of Fifth Avenue and 72d Street, for Mr. James Stillmann.

Messrs. Cable & Lucas are preparing plans for a store and apartment house to be erected on the north side of 42d Street, from Broadway to Seventh Avenue, for Mr. Charles Thorley.

C. L. W. Eidlitz, architect, has filed plans for two three-story brick telephone exchanges, to be built on 79th and 89th Streets; cost, $50,000.

Clarence True, architect, has planned eight six-story brick dwellings, to be built on Riverside Drive, at a total cost of $266,000.

De Lemos & Cordes, architects, have planned a four-story brick office building to be erected on the corner of Second Avenue and 21st Street; cost, $150,000.

M. W. Morris, architect, has planned a brick and stone fireproof extension to the Hotel St. George, Brooklyn, to cost $200,000.

Herts & Tallant, architects, have won the competition for the Aguilar Free Library's new building. It will be a two-and-one-half-story building and cost $35,000.

Schickel & Ditmars, architects, have planned a four-story brick



WINGED FIGURE, TWELFTH-STORY SPANDRELS, BAYARD BUILDING.

dwelling, to be erected on Riverside Drive, for Mr. William. Baumgarten; cost, $25,000.

McKim, Mead & White have planned a six-story brick and stone fire-proof store and loft building, to be erected on Broadway, for J. C. Hoe's Sons.

The Knickerbocker Realty Improvement Company will erect a new hotel on the site of the old Fourth Presbyterian Church, 34th Street, near Sixth Avenue. It will be twelve stories in height, having a frontage of 80 ft., and is estimated to cost about $500,000.

Charles C. Haight, architect, has prepared plans for a brick and stone warehouse eight stories in height, to occupy the block fronting on Hudson Street, from Vandam to Spring Streets, to be erected for the corporation of Trinity Church, at a cost of $450,000.

ST. LOUIS.— The war has very materially affected the building interests here. Nearly all prospective schemes have been abandoned for the present, and in some instances operations have been suspended upon work under headway. A good season's business had been expected, and even now, should there be indications of a cessation of hostilities soon, considerable work of importance may be undertaken.

The trustees of the Barnes Hospital Fund are considering plans for a hospital which will cost over a million dollars. The money was left by the late Dr. Barnes for this purpose some years ago.

The patriotism of our citizens has aroused sufficient interest in our citizen soldiery to start a movement which may eventually give the militia much-needed homes. L. C. and W. M. Bulkley, architects, have prepared plans for an armory for Light Battery A, to be built on Grand Avenue and Rutger Street. The building will be 190 x 212 ft., the front being three stories high. The drill hall, which will be in the rear, will be 179 x 180 ft. Red brick and stone will be the materials used in the fronts.

The proposition to build the armory for the First Regiment has not assumed definite shape, although prominent citizens made an offer to build the same if the city would donate the site of the old City Hall. As the charter of the city will not permit this some other locations are being considered.

Another old landmark is about to disappear. The Dorris Block, on the northwest corner of Olive and 11th Streets, extending nearly to 12th Street, is to be replaced by a six-story commercial building, for which Shepley, Rutan & Coolidge have prepared plans.

The same architects have prepared plans for a six-story warehouse for the Ely, Walker Dry Goods Company, which will cost $100,000.

The committee in charge of the publishing of the new building ordinance report that the book will be out of press in a few days.

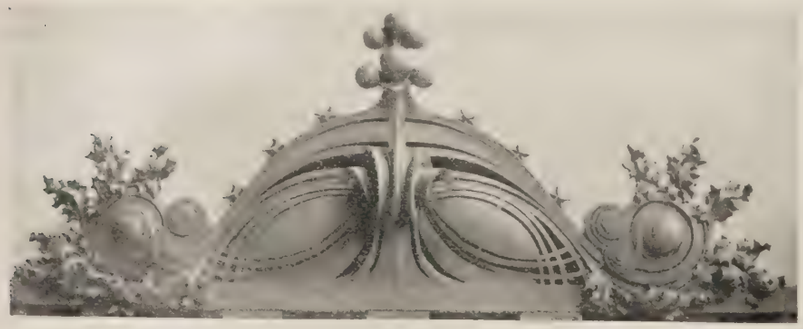
The St. Louis Architectural Club held its regular monthly meeting on Saturday Evening, June 4. A large number were present, and were well entertained by the hosts, Messrs. Stock Dwyer, Stiff, Draper, and Schmidt, who provided not only the customary refreshments, but good music, sketches, a lantern-slide talk, etc.



CAPITAL TO FIRST-STORY COLUMNS, BAYARD BUILDING.

A committee was appointed at the last meeting to inquire into the advisability of holding an exhibition some time during the fall or winter. The committee recommend the same and suggested that it be an inter-club exhibition, and that an effort be made to procure drawings from all the clubs, and that an illustrated catalogue be issued.

The report of the building commissioner for the month of May shows permits issued for buildings amounting to nearly double that for the previous month, but nearly all are for small residences, or unimportant improvements, which would suggest that people are taking advantage of the extremely low prices of building materials and labor to build themselves homes.



DETAIL ABOVE MAIN CORNICE, BAYARD BUILDING.

CHICAGO.—Building reports do not seem to be any better than a month ago, when the figures showed a decrease of nearly 20 per cent. as compared with the work done in the corresponding month of the previous year. One of the most important announcements chronicled this month is that of a twelve-story commercial building for Schlesinger & Mayer, to cost $1,000,000, which is being designed by Louis H. Sullivan. The interior is described as "finish of mahogany and bronze," and the exterior "Georgia marble." It would not be surprising, however, to see the building executed in terra-cotta. That material has been largely the medium of Mr. Sullivan's designs, and with such appropriateness that the additional reason for such a guess is hardly needed, that an existing stone-cutters' strike may lead to the substitution of terra-cotta. Chicago cut-stone contractors say that the competition of terra-cotta has brought them to such low prices that they cannot accept the rule of the stone cutters that there must be eight men employed for every planing machine in operation. If they do accept the rule the stone cutters must accept the alternative of a reduction in wages from $4 to $3 per day. The workmen are not far sighted enough to see beyond the temporary injury done by the use of labor-saving machinery, and they have contributed at this writing some six continuous valuable weeks toward strengthening terra-cotta as a competitor of stone.



PANEL, SPINGLER BUILDING, NEW YORK CITY.
Executed in gray terra-cotta by the Excelsior Terra-Cotta Company.
W. H. Hume & Son, Architects.



DETAIL, STORE BUILDING, PHILADELPHIA.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Frank R. Watson, Architect.

In this connection it is of interest to note that School Architect Patton has made encouraging progress in inducing the board to adopt fire-proof construction. The contract for one school building just let is reported to have cost 13¼ per cent. more than the wood construction previously used. The fact that Chicago spends about a million dollars annually for new school buildings shows the importance of this departure if it proves to be an indication of future policy.

The license system for contractors has gone into effect. As the ordinance reads: "... Each and every person, agent, firm, company, or corporation engaged within the limits of the city of Chicago in the construction or repairing of the whole or any part of buildings and appurtenances, shall be and he or it is hereby required to obtain a license from the city of Chicago ." which license costs $2 per annum, and is obtained without examination.

Among the most important building items may be noted: A warehouse 170 by 120 ft., seven stories, by John M. Van Osdel; apartment buildings by architects Handy & Cady, Sidney Lovell, and H. C. Hoffman; a manufacturing building eight stories, 50 by 160 ft., by John H. Wagner; a ten-story fire-proof commercial building by Holabird & Roche; alterations of Marshall Field retail store by D. H. Burnham & Co.: and a fire-proof manufacturing building by S. A. Treat.



CORBEL.
Executed in terra-cotta by the Northwestern Terra-Cotta Company.
Walker & Kimball, Architects.

The Stock Exchange Office Building, which is 100 by 180 ft. and thirteen stories, was sold recently. The exterior is all terra-cotta, and one of the best of Adler & Sullivan's designs. The consideration for the building with the ground was placed at $2,530,000. Another announcement of importance to Chicago real estate interests is a purchase of three hundred acres on the shore of Lake Michigan, seventeen miles from the City Hall. On this site, it is said that Mr. Frick, of Carnegie Steel Works, and associates, will establish one of the largest steel plants in the world, including in its equipment blast furnaces and steel rail and structural steel rolling mills.

The previously mentioned Ayer Building, designed by Holabird & Roche, which is to cost $200,000, will have a front entirely of plate glass and terra-cotta.



TERRA-COTTA PANEL, INTERIOR BAPTIST PUBLICATION SOCIETY BUILDING, PHILADELPHIA.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Frank Miles Day & Brother, Architects.

A BRIGHT, CLEAN, AND BRILLIANT CITY.

IMAGINE, if you can, a row of business structures with fronts made entirely of enameled bricks. What a contrast to the ordinary dull and uninteresting city block! The first feature to attract the attention would be the variety of design and of coloring, for each separate building would have been the object of a distinct color scheme, according to the idea of the architect who planned it. But all would be alike in one important particular — the harmony of color. Instead of the glaring contrast which is now observable where pressed brick and the various dull stones are the only available materials, there would be a careful

selection of such tints as, taken together, would create a beautiful and harmonious effect. The architect could give free rein to his



DETAIL OF ENTRANCE, LAWRENCEVILLE BRANCH OF CARNEGIE LIBRARY.

ideas in devising ornamental color schemes suited to the particular construction in hand.

This desirable condition is now quite possible by the use of enameled brick. These brick, the best of which are of American manufacture, were originally made in a brilliant glazed white for use in alleys and light courts, but are now made also in any color desired, and either glazed or unglazed. The latter, known as the dull finish, are particularly desirable for fronts, because they preserve, under all conditions of light, the beautiful color effects which the glaze (the glare from which is so objectionable to architects) not infrequently would hide or detract from. At the same time, the unglazed brick are just as impervious to moisture and dirt and as readily cleaned. The durability of both the glazed and unglazed brick has been so well demonstrated to architects as to need no extended comment in this connection. They have been repeatedly frozen and boiled alternately — also heated to a red heat and then plunged into cold water, without injury, the important point being that the enamel has been demonstrated by these tests to be part of the brick itself and not a mere cleavage. Thus they are seen to be not only fire-proof, but absolutely indestructible by any combined force of fire and water.

As to the comparative cost. Enameled brick laid in the wall cost less than 60 cents per superficial foot, being a little cheaper than good Bedford stone, while their advantage over this material is that they are fire-proof and can be easily and cheaply cleaned. Where it may be desired to put an addition either on top of a building or adjacent to it, any colors can be duplicated, and after the entire wall is washed down, the building will be uniform in appearance, the new and the old alike, which would be impossible with materials which absorb dirt or have to be painted. The advantages of cleanliness are not of least consideration in alleys, light courts, and basements, where they are especially valuable for sanitary reasons. They can be washed down as frequently as desired, and dark places made light and healthful. In England, the home of the enameled brick industry, the municipal laws require their use in alleys and courts on account of their sanitary qualities.

The foregoing statements as to the perfection arrived at in the production of American enameled brick, including their durability, beauty, and variety of color and shape, their bright and dull finish, as well as the severe tests mentioned, are based on facts obtained from an investigation of the attainments of the Tiffany Enameled Brick Company, of this city. Their brick are made in all sizes and shapes usually desired by architects, and may be ground perfectly for high-grade archwork. English, American, and Roman sizes are made in stretchers, quoins, octagon, round end, etc., and can be enameled on both faces, when required, for thin partition walls. Any color can be produced to order, with certainty as to uniformity of shade.—*Inland Architect.*

CURRENT ITEMS OF INTEREST.

At St. Louis the price of common brick dropped during the month of May from $5.50 to $4.25 per thousand.

Atlas Portland Cement is being used in erection of Garbage Plant at Boston.

The Union Akron Cement Company are supplying their cement for a large sewer now being constructed at Cleveland, Ohio.

Meier's Puzzolan Cement is being used by Norcross Brothers on a church at Whitinsville, Mass., Shepley, Rutan & Coolidge, architects.

Waldo Brothers have sold a considerable quantity of Hoffman and Atlas Cement for use on Metropolitan Water Board Work at Malden, Mass.

D. D. Cassidy, Jr., architect, Amsterdam, N. Y., is making plans for a four-story store and flat building, which will be constructed of brick and terra-cotta.

Several thousand barrels of Atlas Portland and Hoffman



LAWRENCEVILLE BRANCH CARNEGIE LIBRARY, PITTSBURGH, PA.
Alden & Harlow, Architects.

Rosendale Cement will be used on three sewer contracts at Somerville, Mass.

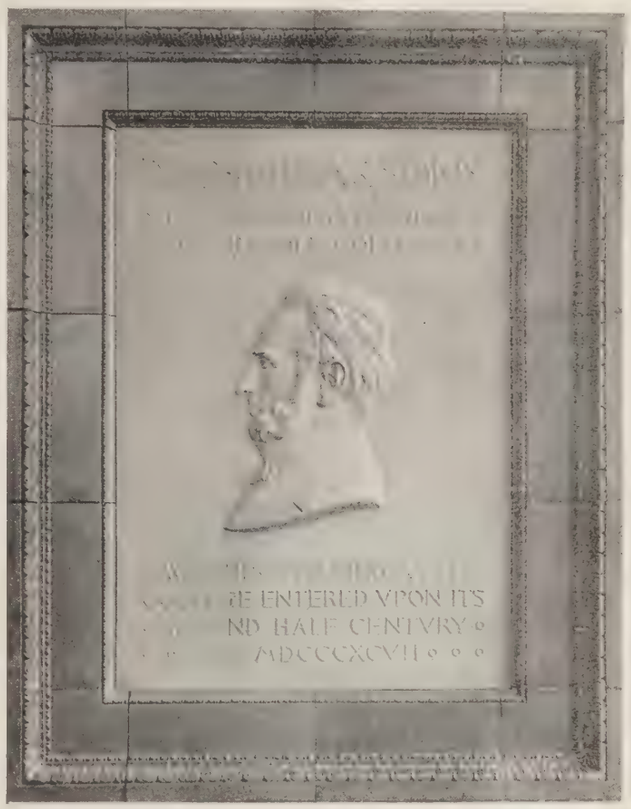
THE BOLLES REVOLVING SASH COMPANY has arranged for the exclusive manufacture and sale of the Queen Overhead Pulley and Window Stop Adjuster. These devices were formerly manufactured and sold by the Queen Sash Balance Company.

W. L. MILLER has bought Atlas Portland Cement of Waldo Brothers for contract for piers on Summer Street, South Boston. Atlas Cement is to be used on all the masonry connected with this new street and bridge.

THE EXCELSIOR TERRA-COTTA COMPANY, through their Boston agent, Charles Bacon, has secured the contract to furnish the terra-cotta for a new hotel at Albany, N. Y., H. Neil Wilson, Pittsfield, Mass., architect; J. Clark & Co., Chicago, Ill., contractors.

WALDO BROTHERS have closed with Horton & Hemenway for the supply of Hoffman Cement for the new Back Bay Station, Boston. Hoffman Cement will also be used on approaches and track-widening changes connected with the new stations of New York, New Haven and Hartford Railway.

THE BOLLES REVOLVING SASH COMPANY have had their sash specified in the following projected buildings: Public schools, Rivington and Eldredge Streets, Houston and Essex Streets, Rivington and Forsyth Streets, New York City; also for the New York Hospital, Cady, Berg & See, architects; and the Hebrew Charities Building, New York City, De Lemos & Cordes, architects.



COMMEMORATIVE PANEL, BELOIT COLLEGE, BELOIT, WIS.
Executed in terra-cotta by the American Terra-Cotta & Ceramic Company.
Patton & Fisher, Architects.

THE plant of the Illinois Supply and Construction Company, at Collinsville, Ill., suffered loss by fire, May 29, amounting to $25,000. The plant will be immediately rebuilt, but no loss will be occasioned by the delay, owing to the fact that they had a large stock of brick on hand.

THE BRICK, TERRA-COTTA AND SUPPLY COMPANY, M. E. Gregory, proprietor, Corning, N. Y., has contracted to furnish the following buildings with terra-cotta: Masonic Temple, Geneva, N. Y., A. B. Camp, architect; Masonic Temple, Monticello, N. Y.; Wilmerding School, Wilmerding, Pa., C. H. Bartelberger, architect; Farrell Building, Buffalo, N. Y., E. R. Williams, architect.

THE DAGUS CLAY MANUFACTURING COMPANY, Daguscahonda, Pa., are supplying through their Philadelphia agent, O. W. Ketcham, 150,000 flashed Roman brick for a new factory at Kane, Pa.; 30,000 pink brick for a new building in New York City, of which D. A. Callahan is the owner; also 30,000 gray brick for the new City Hotel at St. Mary's, Pa.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY, through their New York agents, H. F. Mayland & Co., are supplying the terra-cotta for the new buildings 155, 157, 159 West 34th Street, New York City, George H. Van Auken, architect; also the new building at 80 and 82 Fourth Avenue, William J. Dilthy, architect.

CHARLES E. WILLARD, Boston, removed his office on June 1 from 171 Devonshire Street to a more convenient location on the street floor, at 192 Devonshire Street. Mr. Willard will continue to handle a full line of clay products, and invites inspection of his new exhibit of a large variety of sample brick, of both mud and dry pressed process.

JAMES A. DAVIS & CO., Boston, are furnishing Alpha Portland Cement in the construction of the new Southern Terminal Station, Boston; also for the Back Bay Station sea-wall and bridge foundations. The United States Government is using large quantities of Alpha Portland Cement in their engineering works along the Atlantic coast.

THE UNION AKRON CEMENT COMPANY, Buffalo, N. Y., have closed a contract for 3,000 barrels of Akron Cement with the Alcatraz Paving Co., Philadelphia; and also for 15,000 barrels with E. D. Smith & Co. for the Philadelphia and Reading Subway tunnels which are to be built in the city of Philadelphia.

THE BERLIN IRON BRIDGE COMPANY, Berlin, Conn., are supplying the steel framework on the following new buildings: New station and car house for the Spencer, Warren, and Brookfield Street Railway Company, at Brookfield, Mass.; new building for the Waterville Cutlery Company, at Waterville, Conn.; new power house for the Bryant Electric Company, at Bridgeport, Conn.; addition to the Wilmot & Hobbs Manufacturing Company's plant, at Bridgeport, Conn.; and new power house for the Port Chester Railway Company, at Port Chester, N. Y.

SAYRE & FISHER COMPANY, through their Boston agent, Charles Bacon, are supplying the gray brick being used in a mercantile building now under process of construction at the corner of Beach and Utica Streets, Boston, Winslow & Wetherell, architects; C. Everett Clark, contractor.

The same company has recently taken their third order for enameled brick for the new Terminal Station, Boston, Shepley, Rutan & Coolidge, architects; Norcross Brothers, contractors. They have also secured a large order for enameled brick for the Back Bay Station of the New York, New Haven & Hartford Railway, at Boston, Shepley, Rutan & Coolidge, architects; Horton & Heminway, contractors.

THE MASON SAFETY TREAD is growing in favor with conservative architects and real-estate owners as a protective appliance for

stairways. Among work recently specified are the following-named buildings: Cambridge City Hospital and Randall Dining Hall, Cambridge, Wheelwright & Haven, architects; New England Telephone & Telegraph Company's building, Oxford Street, Clarence A. Perkins, chief engineer for the company; Subway station at Haymarket Square, Howard Carson, chief engineer; Subway stations at Scollay and Adams Squares, and office building of Transit Commission at Brattle and Court Streets, Charles Brigham, architect; First Corps Cadets Armory, Columbus Avenue, William Gibbons Preston, architect; Dorchester schoolhouse, Hartwell, Richardson & Driver, architects; South Boston schoolhouse, Herbert D. Hale, architect; fire-engine house, Haymarket Square, Perkins and Betton, architects; ferry house, South Ferry, city of Boston, Maginnis, Walsh & Sullivan, architects; Worcester County Court House, Andrews, Jaques & Rantoul, architects; State Hospital for the Insane, Westboro, Kendall, Taylor & Stevens, architects; Cambridge Savings Bank, C. H. Blackall, architect; Brookline Savings Bank, F. Joseph Untersee, architect; town hall, Revere, Greenleaf & Cobb, architects; police headquarters and court house, Newton, Lewis H. Bacon, architect; Union Station, Omaha, Walker & Kimball, architects; Alice Building, Providence, R. I., Martin & Hall, architects; Besse Building, Springfield, Mass., B. H. Seabury, architect; Meier & Frank Building, Portland, Ore., Whidden & Lewis, architects.

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COMPLETE BRICKMAKING PLANT OF W. C. HILL ESTATE, NOW RUNNING AT GOOD PROFIT, NINETEEN ACRES OF LAND ONE MILE FROM POST OFFICE, SEATTLE, WASHINGTON. PRICE, $30,000. WILLIAM H. LEWIS, ADMINISTRATOR, P. O. BOX 52, SEATTLE, WASHINGTON.

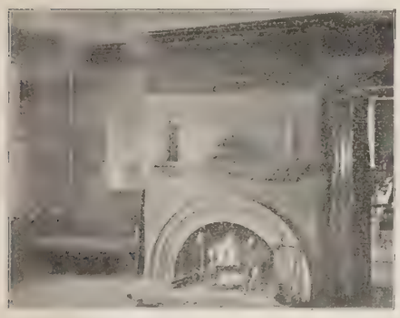
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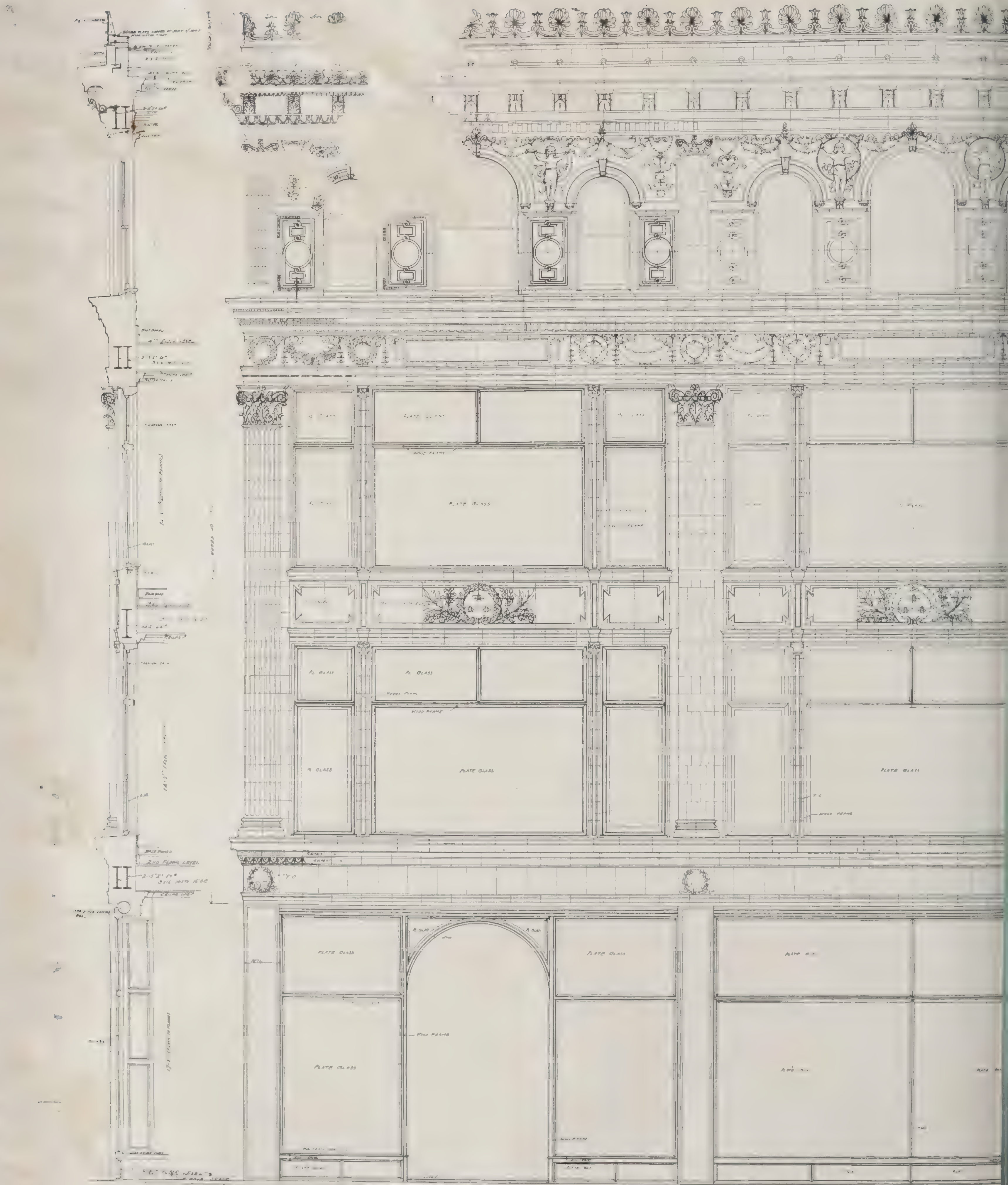
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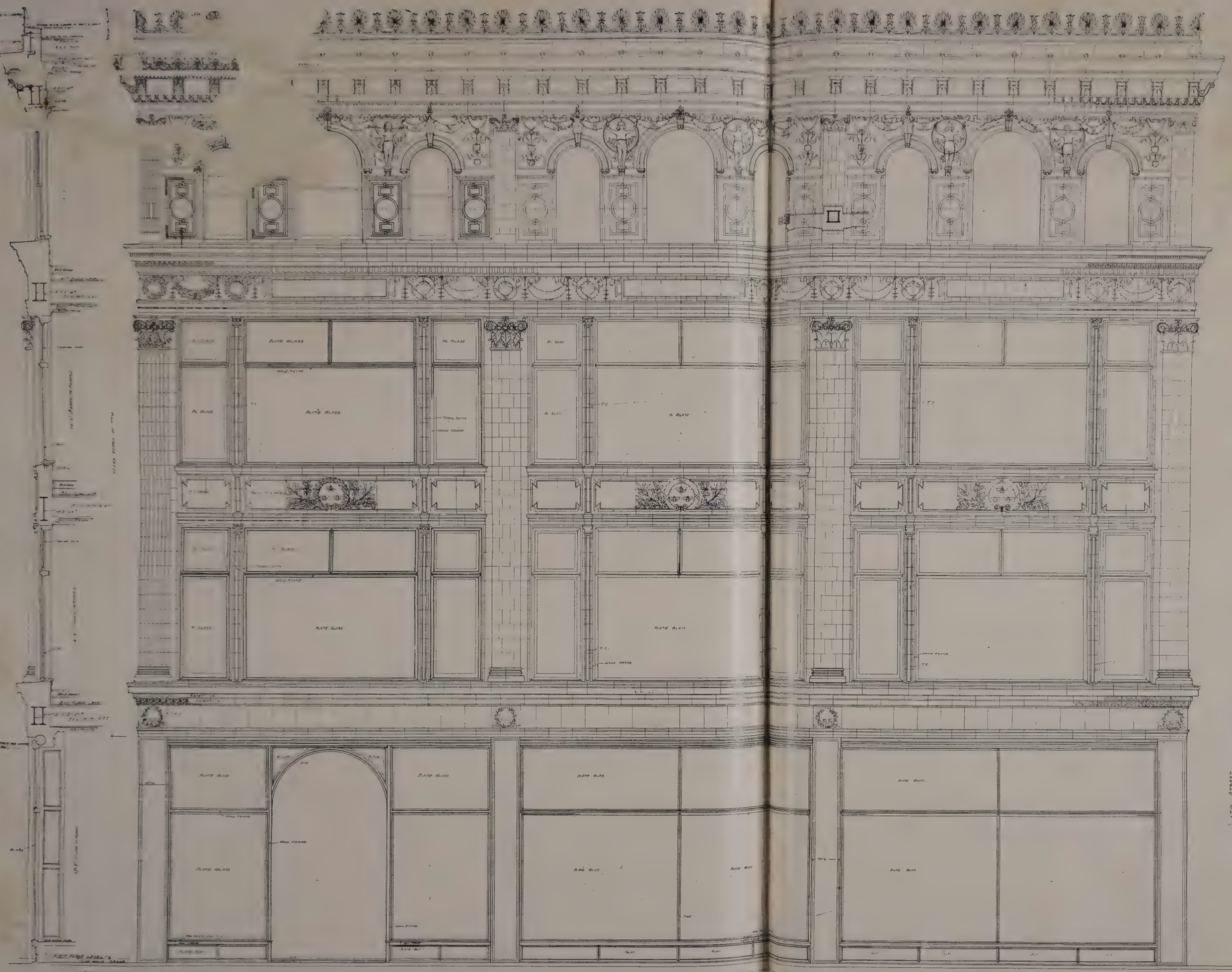
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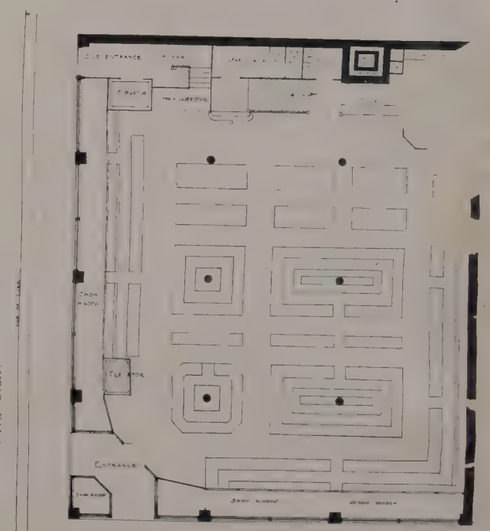




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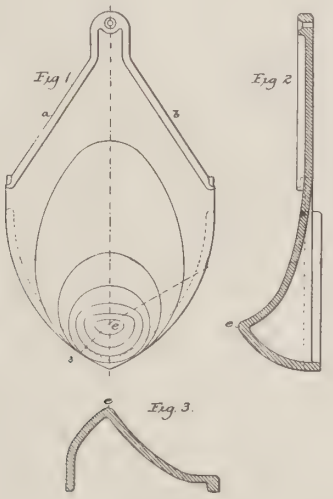
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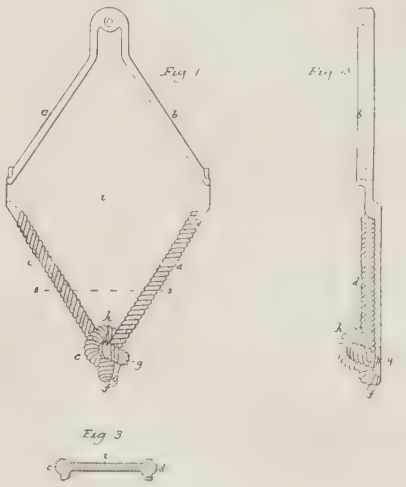
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From the fact that by our construction all of a dozen different styles of tile have exactly the same shape on the upper half of the tile, they can be laid together and will interlock, no matter what the shape of the bottom.

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VOLVME VII JULY 1898 No. 7

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

ROGERS & MANSON,

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THE BOSTON SUBWAY; A LOST OPPORTUNITY.

IT is the present expectation that the Boston Subway will be completed and in actual use early this fall, possibly by the first of September. About a third of it has been in operation now for nearly a year, and the public has had a pretty good opportunity to judge of its value. We believe that we are right in saying that the general consensus of opinion is that as an engineering structure it is well planned, well built, and that on the whole it fulfils all the practical requirements had in view at the time of its inception. The surface tracks which it was intended to supplant have not yet been removed, but the traffic on the streets above has been made very much more free, and there has been an almost entire absence of blockades in the subway itself. As a means of inter-communication between different portions of the city it is undoubtedly a success.

The subway has been built under the direction of a commission which was appointed by the Governor. This commission, as originally constituted, included three lawyers, one professor of engineering, and one gentleman who could, perhaps, be most fairly classed as a capitalist. The changes which have occurred in the commission have not altered the proportion of lawyers, nor have any other professions been represented. At no time has there been upon the board, either as member or adviser, an architect or any one with the slightest claim to trained artistic ability. It would be hard to select a commission composed of men more thoroughly matter of fact and business-like in every attribute. They have done their work admirably from a mechanical standpoint. They have drawn around them the very best of engineering advice, there has not been a suggestion of anything but the most strict, business-like proceeding from first to last, and as far as the commission has gone it is certainly deserving of the most hearty thanks for the manner in which it has conducted the work. If the subway were nothing but a big sewer, or a system of underground conduits to carry water, we should say that nothing more could have been hoped for or desired. Unfortunately it is a work of public utility which is constantly before the eyes of thousands of citizens, and it is a matter of the deepest regret that the commission, after having shown such unusual executive ability, and after having solved so satisfactorily the practical considerations, should have seen fit to so utterly ignore every consideration of art or beauty below ground. The interior of the subway is about as enlivening and cheerful as a second century catacomb. There is not one single redeeming feature about it in an esthetic sense, and it is the strongest sort of epitome of the unfortunate way in which the artistic element is so totally disregarded in our public work.

The average Philistine of the type which is represented by our able subway commission seems to be imbued with the feeling that art is a condition which can be tolerated, and within certain limitations grudgingly admired, provided it does not entail any expense; that the moment the artistic element begins to count as a factor in the cost it must be sternly suppressed. We, as a nation, are gradually developing into an appreciation of the educational value of good looks. We are not there yet, by any means, and the prospect is sometimes dreary, but we are not quite so badly off in this respect as we were two generations ago, and there are fortunately a few leading spirits who appreciate that a public work is not put up simply as a money-saving machine, that works of public utility may rightfully take to themselves a certain element of artistic appearance, and that the expenditure of a small added percentage in money is well repaid by the constant enjoyment which it can afford. We appreciate this sentiment in our public parks. Boston is spending millions of money every year to provide and maintain a park system which shall be not merely healthful, not merely afford good air to the poor, but shall be positively and appreciably beautiful and artistic. No one questions the wisdom of this expenditure, no one would have it restricted, and every one enjoys the results. In exactly the same manner the Boston Subway should have been treated as an opportunity to not only accommodate the people in a thoroughly business-like manner, but also to accommodate them in surroundings which would at least not be distressingly ugly.

Specific comparisons may be dangerous, but we cannot forbear referring our readers to the issue of this journal under date of December, 1893, wherein was shown a possible arrangement for the subway which would have permitted of a very considerable display of taste, good proportions, and pleasing colors, without involving a decided additional cost. If any one doubts the possibility of the successful treatment of such a problem as the subway presents he has only to recall such a building as the so-called Mosque at Cordova, a structure the style of which could have been reproduced in our subway stations with extremely effective results and in a manner which would have been much more permanent than the ghastly painted white columns and girders and the absolutely uninteresting lines of the existing structures. We will venture to say that any one of fifteen or twenty architects throughout this country who could have been selected could have made the subway interesting, worth the going to see for itself, and every bit as valuable in a practica

sense without involving an added expenditure of more than ten per cent. We believe, as we have repeatedly stated in these columns, that the only material suitable for constructing a work of this kind is brick in one or another of its forms; that had the ceiling been vaulted throughout in substantial masonry, the construction would have been more permanent and would have allowed a better opportunity for pleasing effects; and even if artistic considerations must perforce give way to engineering judgment, and we are obliged to use the species of steel-skeleton construction which was followed in the subway for the walls, it at least might have been lined throughout with enameled brick, not necessarily a plain white, but in some pleasing colors which would rest the eye and give a little relief to the senses. The commissioners made some very careful investigations as to what material to use for lining these walls. They finally decided on a facing of Keene's cement, which has been put in the finished portion throughout, except at the stations, and when fresh presented a very pleasing appearance; but before the work had been in use a month it began to look disreputable, and is now simply an unsightly, blotchy plaster wall. We were told at the time that the reason for this selection was that to use enameled bricks throughout would involve an added expense of $300,000. This is simply an example of that thrift which is the curse of so many of our public monuments and for which our descendants will not rise up and bless us.

The unthinking passenger who rushes down the subway steps, buys his ticket, and rushes off through the swiftly moving cars, may reason that the tunnel as built is as good as though better looking, that as long as the work is done well and the cars expeditiously despatched, that is all that can be expected; but the man who thinks, the man who knows what might be and has had opportunity to appreciate the influence in the long run, on the passing crowd, of good proportions, agreeable colors, and artistic arrangement, will feel every day he enters the subway, that it is a lost opportunity, that we might have had in this undertaking a piece of engineering work which could have been clothed with architectural beauty and been a pride to the city quite as truly as our parks or gardens. We have to thank the subway commission for their excellent work, their scrupulous business methods, but, unfortunately, we have also to thank them for building an ugly hole in the ground, constructed so well that we can never hope to afford to tear it out and do it as it ought to have been done.

BOOK REVIEW.

THE LAW OF MECHANICS' LIENS UPON REAL ESTATE IN MASSACHUSETTS. By Henry T. Lummus, LL. B., of the Essex Bar. Little, Brown & Co., Boston.

Very few works have been written upon the topic of lien laws, and fewer still have any tangible value to the layman, as it is a subject which in its practical application can most safely be left to one's lawyer. The best that can be hoped from such a volume, in as far as it appeals to a possible party to a suit, is that it shall present a careful classification of decisions and intelligent generalizing of conclusions. In order to be of real value such a work must of necessity be quite local in its nature, as the customs vary greatly in the different States. Mr. Lummus has put into very compact shape the present law of Massachusetts as regards mechanics' liens. The subject matter is presented in a very easily understood form, and is accompanied by a thorough cross index which makes the work unusually valuable. While the best way to avoid liens on a building is to have nothing to do with any but thoroughly responsible contractors, still the most careful architects and owners are occasionally caught unawares, and a study of the 139 pages of this book will go a long ways towards posting one as to individual rights and the way to obtain them.

PERSONAL.

Albert Kelsey, former president of the T Square Club, Philadelphia, has just returned from an eighteen months' stay in Paris and the Continental cities of Europe, where he has made an especial study of the "Science of Cities" for the University of Pennsylvania. In this connection Mr. Kelsey expects to deliver a course of lectures on "Focal Points in Foreign Cities," "Urban Circulation, Transportation and Delivery," and "Commercial Architecture."

Mr. J. George Morgan, architect, Philadelphia, member of the T Square Club, has been appointed second lieutenant in the Volunteer Engineer Corps, U. S. A.

Frank E. Wetherell, architect, formerly of Peoria, Ill., has opened an office at Oskaloosa, Iowa. Catalogues desired.

A. B. Rosenthal, architect, has removed his office from 620 Milwaukee Avenue to 81 Dearborn Street, Chicago, Suite 341–43.

J. L. O'Connor, architect, Openheimer Building, Austin, Texas, will be glad to receive catalogues.

ILLUSTRATED ADVERTISEMENTS.

THE following illustrations appear in our advertising pages: Land, Title, and Trust Company's Building, Philadelphia, Pa., D. H. Burnham & Co., architects; advertisement of Conkling, Armstrong Terra-Cotta Company, page v; mantel in hall of Miss Fitzgerald's house, Roxbury, Mass., William G. Preston, architect; advertisement of Fiske, Homes & Co., page vii; residence of Louis Schoellkopf, Esq., Buffalo, N. Y., C. D. Swan, architect; advertisement of The Harbison & Walker Company, page xv; Manhattan Hotel, New York City, H. J. Hardenbergh, architect; advertisement of Henry Maurer & Son, page xxiii; shapes of roofing tile made by the Celadon Terra-Cotta Company, Limited, in their advertisement, page xxvii; illustration showing ten positions in which the Bolles Revolving Sash may be placed, page xxxvi.



HERALDIC PANEL FROM THE HOTEL RALEIGH, WASHINGTON, D. C.
Executed by the New York Architectural Terra-Cotta Company.
H. J. Hardenbergh, Architect.

The American Schoolhouse. IX.

BY EDMUND M. WHEELWRIGHT.

THE schools in which courses in mechanical training are given in conjunction with the principal courses of high schools are known either as "Manual Training" or "Mechanic Arts High" schools.

In these schools manual skill is not taught for its own sake. By the course of instruction offered, intellectual activity is encouraged through knowledge of tools, materials, and forces, as well as through books. Manual training is but one, and in many cases the smaller, part of the instruction given; such training is used as a means to an end and not as an end in itself. "Mechanic Arts High," although a clumsy word, more closely designates the purposes of such schools, while the name of "Manual Training" confuses the purpose with that of the technical trade schools, whose object is purely utilitarian. If the mechanic arts high schools have a future success commensurate with that of the past it is not improbable that a better designation need not be sought, and the need will not exist to use any other name than that of high school.

Schools of this type, the most distinctly American development of schoolhouse architecture, are provided with the class rooms, recitation rooms, and laboratories, and drawing rooms of the high schools, and in addition have rooms equipped with machinery for wood and metal working, with carpenters' benches, forge shops, and in some cases molding and modeling rooms.

These schoolhouses are the most complex and latest development of the high school in this country, and as such necessarily have not yet been perfected in all their features. But few schools of the type completely designed for this purpose have as yet been built and there are no foreign models to help us except in regard to minor details. The development of the plan of the mechanic arts high school offers still an important field for the joint labors of our educators and architects.

In many cases, to meet the needs of such instruction, existing buildings have been adapted for shops. At St. Louis, Chicago, Cambridge, and Boston, especially designed high schools of this type have been built. At Toledo, an addition for work shops, etc., has been added to a high school building.

The St. Louis Manual Training School was built partly in 1879 and partly in 1882, at a time when there was little precedent to guide its projectors. On the third floor of this building is the first-year schoolroom fitted with ninety-six desks for first-year pupils, two recitation rooms, each fitted with twenty-four shelf chairs, a drawing room, physical laboratory, one wood-working room with benches for twenty pupils.

On the second floor is the second-year schoolroom with eighty-eight desks, this class being composed of four divisions of twenty-two each. Here, also, is a wood-working room with twenty-four benches and twenty-four turning lathes, a molding and soldering room with twenty-four benches, and a drawing room.

In the first story is the office of the principal, the third-year schoolroom with sixty-three desks, the forging shop with twenty-two forges and anvils, of which but twenty are shown on the plan here given. There is no basement under the forge shop. The machine shop is also on this floor. This room is equipped with lathes, drills, and other machine tools and has fourteen benches, marked B on the plan, and dressing lockers (marked C). A small chemical laboratory adjoins the first-year schoolroom.

The second and third floors are provided with the requisite wash rooms; hose for the first-floor shops are placed in the basement. Here, also, are dressing rooms and toilet rooms, the engine room, the repair shop, a lunch room and a warm-air chamber, the boiler being in a separate building. Under the steps is the fireproof oil room.

Dr. C. M. Woodward, the director of this school and author of a treatise on "The Manual Training School," says, in criticism of the plan of the Toledo school: —

"1. The forging shop, which is the noisiest shop in all, is rather too near the schoolrooms. In warm weather, when the windows are open, the noise is somewhat troublesome. I should prefer a plan which turned the shop wing ninety degrees to the left, so as to place the forging shop directly beyond the machine shop. In other words, I would put the school and drawing rooms at the head of a T, and the shops in the long central part, with the forging shops at the extreme end.

"2. There is no well or shaft for the transmission of power to the several floors from the basement. The transmission should be from floor to floor by belts with suitable tighteners. Each shop should be furnished with a clutch, by means of which the teacher in charge may turn on his shop or turn it off at pleasure, without interfering with the other shops. At times the teacher needs a quiet room where his voice may be easily heard as he gives the theory of a machine, explains the details of a process, or criticizes work before a class. In the transfer of power, gearing is too noisy for a school. The main shafting and pulleys of the machine shop of the St. Louis school cannot be stopped without stopping the engine. While this defect is hard to remedy, it may easily be avoided in a new plan.

"3. On the third floor I would interchange the wood-working shop with the drawing and physics rooms. This would accomplish two things; first, it would place the drawing room and physical laboratory over a comparatively quiet room, as there is no noise in the molding



FIRST FLOOR. SECOND FLOOR. THIRD FLOOR.

ST. LOUIS MANUAL TRAINING SCHOOL, ST. LOUIS, MO.

room; and, secondly, no divisions would pass through a shop where the boys are at work."

Dr. Woodward further suggests that, "As a rule, the study and recitation rooms should be separated from the shops by two walls enclosing halls, stairways, or yard; at the same time I should prefer to have all the rooms for a class on the same floor, or as nearly so as possible, and but a few steps away. It may not work badly to have a division cross the yard, but I advise strongly against sending a division out of the yard, or across the street. I do not favor the transfer of a division of students from one principal to another and back again. No principal would like that arrangement in the case of such a study as arithmetic or spelling, and shop work and drawing should be treated with precisely the same consideration. The same precautions should in all cases be taken to prevent irregularities and loss of time. In short, manual work should be treated as school work, and watched and guarded and sustained as such."

The High and Manual Training School of Toledo, Ohio, is an addition made in 1885 to a large high school. It has three stories and a high basement, in which is placed the forge room or blacksmith shop, the molding room, lumber room, and engine room. The large shops are 40 by 55 ft. The machine shop is on the first floor. Here, also, is the wood-working room, which is fitted with lathes and twenty-four benches. The wood-working room on the second floor is fitted with benches only.

In the Toledo school provision is made for manual training for girls. The girls are taught in divisions by themselves drawing, light woodwork and carving, cooking as a branch of applied chemistry, needlework, cutting, and fitting. One of the large rooms of the second story, and in the third story the corresponding space, is divided into two rooms, one of which is the cooking room, which is thus described in the catalogue of the school:—

"This is 40 by 27 ft., with one large Garland range, two gas cooking stoves, and five double tables 5 ft. long by 5 ft. wide, each table accommodating four pupils. Each girl has her own table space for work, and there is a small gas stove for every two pupils. Each table space has a drawer and cupboard below it for all essential utensils, and each pupil must personally go through every process taught. At the other end of the room are pantry closets for the teacher's use, and a commodious wash room, with all conveniences for girls, including individual closets for the keeping of aprons, clothes, etc."



TOLEDO HIGH AND MANUAL TRAINING SCHOOL, TOLEDO, OHIO.

In the Toledo school each work room is provided with ample wash rooms, which are very important adjuncts of schools of this type.

The Cambridge Manual Training School for boys was founded by Mr. Frederick H. Rindge. The shops and drawing rooms are in a building by themselves, connected by a covered way with the building assigned to the academic course.

In this latter building are the schoolrooms, physical laboratory, assembly hall, fire drill hall, and gymnasium.

The following description of the building for manual training is quoted from the report of the Cambridge High for 1892, written by Dr. Parmenter, now master of the Boston Mechanic Arts High School.

THE WOOD-WORKING ROOM.

In this room there are two departments, one being for general carpentry, and one for turning and pattern-making. On the east side are eight wood-worker's benches, 34 ins. high, with a top 66 by 43 ins. A vertical board, 5 ins. high, divides the top of each bench into two equal parts, thus making it possible for two pupils to work at the same bench, one on each side, without danger of interference. Below the top of the table, at the right of the worker, are three drawers, 23 by 5½ ins., with a depth of 26 ins., each fitted with a lock. Each pupil has one of these drawers in which to keep the individual tools supplied to him, and his unfinished work. The remaining space below the top of the table is converted into a closet designed to hold most of the implements used in common by the members of different divisions.

The saws are kept in a special case provided for them in the front end of the room. They are numbered to correspond with the benches, and each pupil is charged with those which he receives and is held responsible for their return, in good condition, to their proper place, at the end of each working period. Between two of the windows is a case for storing the "blue prints" from which the pupils work. This case is 4 ft. 6 ins. high, 2 ft. wide, and 12 ins. deep, and is conveniently divided into pigeon holes for fifteen sets of "blue prints." Near the benches are several stationary glue-pots heated by steam and always ready for use. Conveniently located for preparing materials for the work of pupils is a double arbor bench saw, capable

of being quickly adjusted for either cross-cutting or splitting, and furnished with the most approved devices for facilitating work.

Running the entire length of the west side of the room, in front of the windows, is a bench supplied with pattern-maker's tools, and adapted to be used by divisions of twelve pupils. Attached to this bench, separated by convenient distances, are twelve Fitchburg quick-action vises, with 9 in. jaws, and near each vise is a set of three drawers, one of which is assigned to each pupil for his individual tools and unfinished work. By the side of the drawers, in each section, is a locker designed to contain the tools which are used in common by members of different divisions.



CAMBRIDGE MANUAL TRAINING SCHOOL, CAMBRIDGE, MASS.

In front of this bench, at a convenient distance from it, is a row of twelve pattern-maker's lathes, each having a 6 ft. bed, and capable of doing work 12 ins. in diameter. Two lathes are placed side by side, 2 ft. apart, their bed pieces being connected by a case carrying two drawers, each fitted with a lock, and designed to hold the tools used in wood turning.

At one end of this row of lathes is a large pattern-maker's lathe, having an 8 ft. bed and being capable of doing work 20 ins. in diameter. This lathe is fitted with the most approved devices for doing all kinds of work, and is designed to be used only by the instructor and by pupils who develop special skill and demonstrate their ability to do a high order of work. By its side are two iron speed lathes, 9 in. swing, 42 in. bed, constructed in the machine shop by the members of the class of '91. Near at hand are a band saw, 26 in. wheel, fitted with an adjustable iron table and a scroll saw, both of the most approved pattern. A tool closet, located in the center of this room, is supplied with a great variety of tools adapted to every possible need of a wood-working establishment. The lumber loft is easily reached by a flight of stairs leading to the top of this closet.

THE IRON-WORKING ROOM.

This room, like the wood-working room, is fitted for two distinct kinds of work. The appliances upon the west side are adapted to general iron fitting,— chipping, filing, drilling, scraping, etc.; while those on the east side are for use in machine-shop work. Upon the west side are located four benches 3 ft. high, and having a top 9 ft. by 3 ft. 8 ins. A vertical wire screen, 24 ins. high, divides the top of each table in the center and serves to protect pupils on opposite sides from the chips which fly from each other's work. Each side of these benches is furnished with two vises and two sets of four drawers, the upper drawer of each set being used in common by the pupils of different divisions. One of the three other drawers is assigned to each pupil for his individual tools and work. At the beginning of a lesson each pupil obtains from the tool room a tray which fits the upper drawer of each set, and which contains all the tools used by the pupil except the hammer.

In addition to the benches described above, there is a side bench furnished with a large number of tools needed for special work. Four small speed lathes are also used in this department for drilling, hand-turning, and polishing.

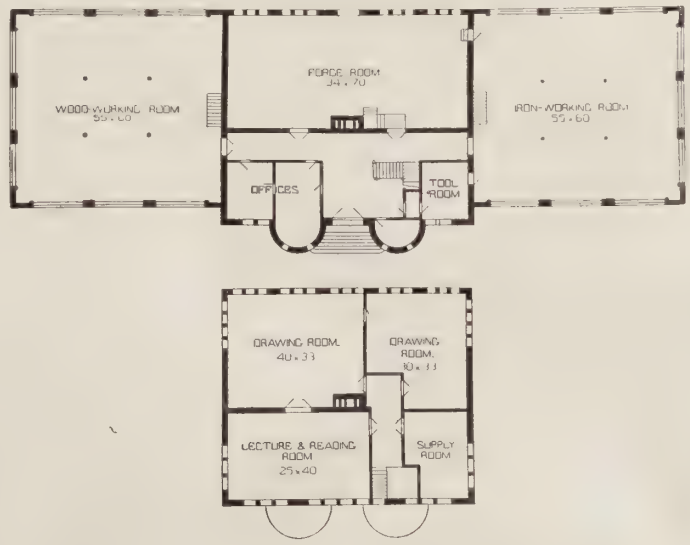
On the opposite side of the room are the equipments of the machine-shop department, consisting of engine lathes, four 16 in., one 15 in., seven 14 in., and one 11 in.; one Brainard, No. 3, milling machine, with attachments; one cutter-grinder; a 24 in. planer; a 15 in. shaper; a 24 in. upright drill; a sensitive drill; a 36 in. grindstone, and an emery grinder. The entire side of the room is occupied by a long bench like that found in the pattern-making department, fitted with twelve machinist's vises and as many sets of drawers in which are kept the tools.

The tool room is furnished with drills, reamers, arbors, taps, lathe dogs, and tools of every variety in sufficient number to supply each boy with whatever he needs to complete a given job. The common cutting tools used by each pupil are those which he forged the year before. Each boy is given ten checks, bearing his school number, which may be exchanged at the tool room for the articles needed; the check takes the place of the tool loaned until it is returned in good condition. A small cupboard, attached under each lathe, contains wrenches, change-gears, and other lathe accessories. Similar arrangements are made for the accessories of other machines.

The engine which drives all of the machinery is situated in the iron-working room, and is under the charge of a competent engineer, who gives a course of instruction concerning the construction and care of engines and boilers.

THE FORGE ROOM.

The room is furnished with fifteen Sturtevant portable forges, each connected by proper pipes with a blower, and with an exhaust fan which prevents the poisoning of the air by coal gas, and secures perfect ventilation. Near each forge is an anvil weighing 125 lbs.;



FLOOR PLANS, CAMBRIDGE MANUAL TRAINING SCHOOL.

and a tool bench, 25 ins. high, with a top 21 by 16 ins., surrounded by a rim 2 ins. high, to prevent tools from slipping off. Each bench is furnished with three drawers, which occupy the entire space below the top. A standard 3 ft. high, attached to the back of the bench, supports the "blue prints" from which the pupils work.

Six wooden pillars are fastened securely into the masonry of the floor, in convenient locations, to each of which is attached a wrought-iron blacksmith's vise having 4½ in. jaws. Numerous other tools, needed for special kinds of work, are to be found in different parts of the room. Nothing is wanting which is likely to be needed by a blacksmith. The boilers which generate steam for

the engine and for heating the building are located in this room. These boilers also furnish steam for heating the new building for the academic department, and for driving the ventilating fan which supplies its rooms with fresh air. They are supplied with a feed-water heater, feed pump, injector, damper regulator, and all accessories of practical utility.

THE DRAWING ROOMS.

These large, well-lighted rooms, situated upon the second floor, contain thirty double tables, 36 ins. high, with a top 24 by 76 ins. Each table has two large drawers, designed to hold the drawing materials which are used in common by the pupils of different divisions.

The teacher's platform, measuring 6 by 10 ft., is elevated 3 ft. above the floor, thus making it possible for the most distant pupils to obtain an unobstructed view of the objects placed upon the teacher's table, and of the illustrations upon the blackboards, the lower edges of which are 3 ft. above the platform. These blackboards, three in number, are placed one directly in front of another, each being counterbalanced by weights, like an ordinary window sash, so that it can be dropped down out of sight.

In the rear of the room are cases of small drawers, one of which is assigned to each pupil for his drawings and individual drawing material. Near at hand is the apparatus used in making "blue prints," including a most convenient and efficient device for holding the prints while they are exposed to the sunlight.

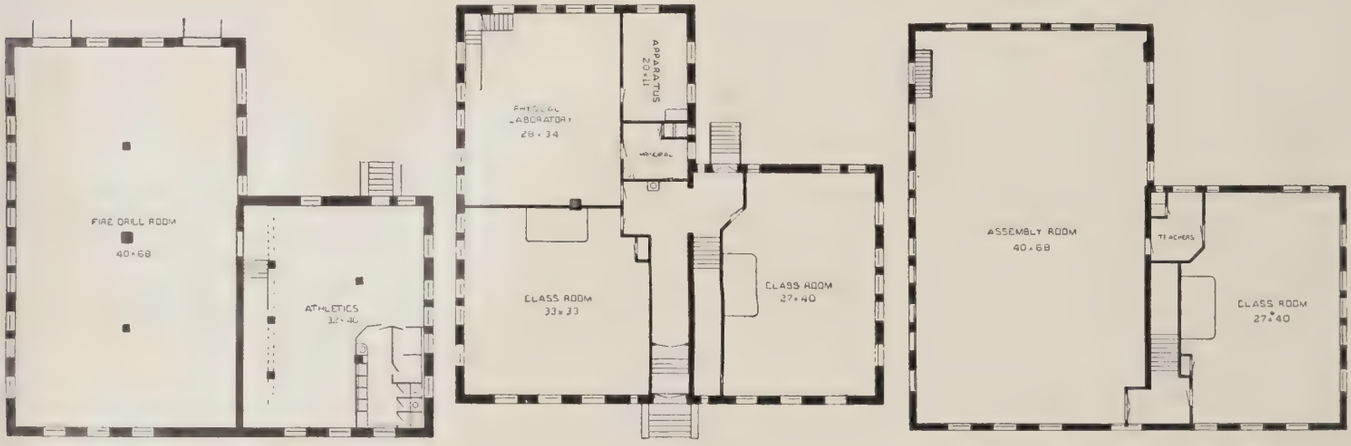
All the appointments of this room, like those of each of the other rooms, are first class in every particular, and the work of the pupils shows that they appreciate their advantages.

Adjoining the drawing rooms are a reading room and a supply room.

THE BASEMENT.

With the exception of the space required for the janitor's room, the central portion of the basement and the entire southern wing are devoted to toilet rooms, wash rooms, and two hundred and seventy-five large lockers for the accommodation of the pupils' clothing. These lockers are grouped about large sinks supplied with hot and cold water. Leading from one of the wash rooms is a well-appointed shower bath. These rooms are kept in perfect order, and are under the constant supervision of an efficient janitor. Every needed convenience has been provided, and no pupil is permitted to form slovenly personal habits. Each pupil must provide himself with a hair brush, comb, shoe brush, whisk broom, two towels, wash basin, and soap dish.

In the northern wing is a large kitchen, furnished with a hotel range and the best modern appliances. Adjoining the kitchen is a small dining room in which dinners are served, at cost, to the instructors and such pupils as desire them. The remaining space in this wing is devoted to a supply room, and to a large dining room in which pupils eat the lunches which they bring to school.



BASEMENT. FIRST FLOOR. SECOND FLOOR.

FLOOR PLANS OF BUILDING FOR ACADEMIC DEPARTMENT, ERECTED IN 1893, CAMBRIDGE MANUAL TRAINING SCHOOL.

RULINGS ON QUESTIONS CONCERNING REAL ESTATE UNDER THE WAR REVENUE LAW.

A SERIES of hypothetical questions were submitted to the internal revenue officials at Washington yesterday by the *Herald's* staff in that city, and, with the answers, are reproduced below, in the hope that they will make plain some matters hitherto undecided: —

Question: Must the actual consideration be stated in a deed, or will it suffice to say "$1.00" and stamp to cover the actual consideration? *Answer:* The actual value need not be stated, but stamps must be affixed for the full value.

Question: If a piece of real estate, worth $10,000 and sold on that basis, is sold for $5,000 cash and a mortgage of $5,000, must the deed be stamped to cover the $10,000 or the equity, $5,000? *Answer:* Stamp must be for the entire value.

Question: If there is already a mortgage of $5,000 on a parcel worth $10,000, must the deed be stamped to cover $10,000 or the price paid in cash? *Answer:* Stamps must be affixed for $10,000.

Question: Under the law, both promissory notes and mortgages must be stamped. Must the note accompanying a mortgage be stamped as well as the mortgage? *Answer:* Both must be stamped.

Question: It is customary to allow mortgage notes to run after they are due without renewal. Would such a note, properly stamped when issued, be good beyond the original time if not restamped? *Answer:* Where there is no renewal the original stamp is sufficient.

Question: Mortgage brokers are held to be subject to the $50 broker's tax. If a broker (real estate) sells a piece of real estate for $10,000, of which $5,000 is cash and $5,000 on a mortgage given by the purchaser to the vendor, does he become a "mortgage broker"? *Answer:* No.

Question: If a broker sells a parcel of realty on which there is already a mortgage, which the buyer assumes, does he, by such business, become a "mortgage broker"? *Answer:* No; if he confines himself to purely real-estate transactions.

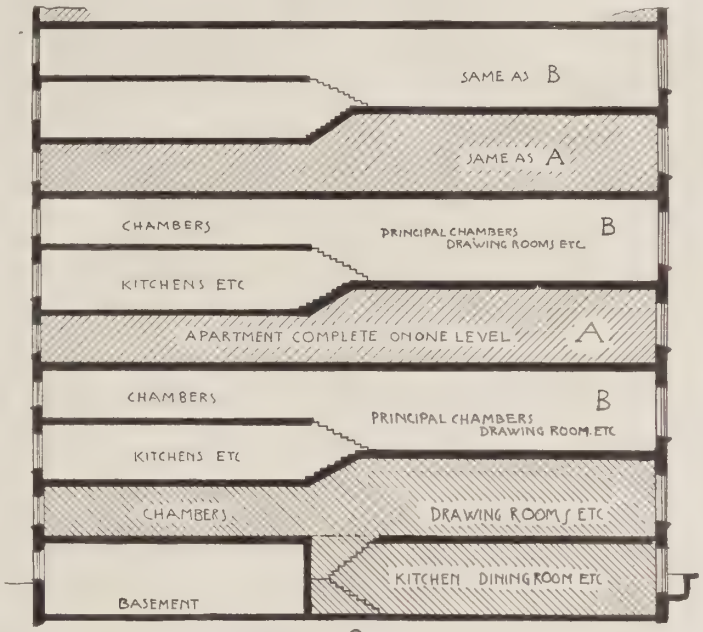
Question: Can a man, not a broker by trade, receive any part of a commission for a transaction in which a mortgage figures without becoming a "mortgage broker"? *Answer:* No; not in a single instance. —*Boston Herald.*

Architecture of Apartment Buildings.

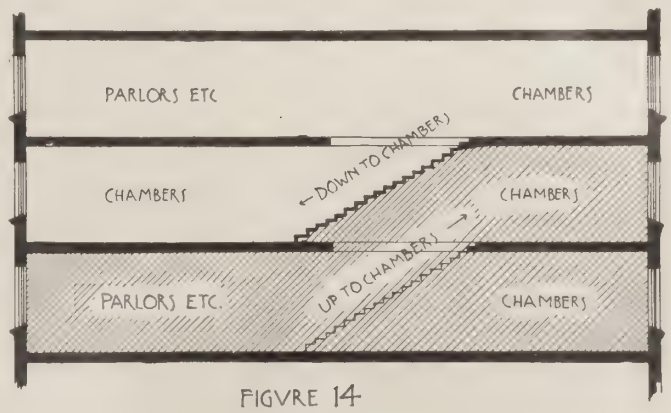
II.

BY IRVING K. POND.

BEFORE going too deeply into the arrangement and disposal of the single rooms of an individual apartment, the architect should give great consideration to the problem of the public halls and corridors. The man who is ordained by fate, beneficent or otherwise, to dwell in an apartment must be made to feel, and in the true sense, that his apartment is his castle, just as the householder is made to feel that his house is his safe retreat. It is the rule of the best designers of houses in blocks never to place in close proximity the main entrance doors of two adjacent houses, but to make each main entrance a separate and distinct feature. This rule exists in response to a very natural and proper demand on the part of refined and sensitive householders to have their homes in outward expression, as in absolute fact, places of refuge and retirement. The dweller in an apartment has the same rights as has the householder, and it is the duty of the architect to respect these rights; to go further, even, and inspire this feeling for privacy, and foster into an abundant growth what might not flourish otherwise. It is the rule of the best designers to allow, where possible, but one, and never more than two apartments to open from the public hall in any one story. And rather should a designer work to apply this rule simply than by misplaced ingenuity seek to corral a number of families on one stage, and herd them about one stairway or elevator well. There is a loss of self-respect to all concerned when this rule is not applied, and most especially so when the freight elevator is allowed to open off this same public hall; for then the public hall to which only the members of families and their friends, and these in street dress at least, should be permitted, becomes the runway of the butcher, the baker, the grocer, and the servants in the garments of the kitchen and the scullery, and where is self respect! The suggestion of privacy and isolation should begin at the street door, and still be in evidence at the thither wall of the rear chamber. Trial upon trial has been made by designers of recognized ingenuity to get the service across public corridors without bringing it into sight, but never has the success been startling. One expedient was to cross the public corridor in a sort of mezzanine story, but this required rather more of a height to the stories than is desirable in any but the most sumptuous apartment buildings, and there the question never should arise. This point cannot be too strongly insisted upon, that all service connected with individual apartments should be religiously excluded from the public corridors.



FIGVRE 13



FIGVRE 14

The position of living room, dining-room, kitchen, and chambers in relation to each other, and to give the best effect of homelikeness, desired privacy, and the highest economy of service, has been discussed, but something should be added as to the special position or situation of each of these, and of other rooms necessary to a complete apartment.

The living room and library should, of course, be given the sunniest and most pleasing prospect compatible with the location of the building.

As to the dining-room, while it is desirable in common with all rooms that direct sunlight should penetrate it at least during some period of the day, it is not necessary that this room should be as sunny, even, as the chambers. The most pleasant and homelike of the many repasts are those partaken of under the soft glow of the lamps, and social gatherings at the board, almost without exception, are under artificial light, when the sparkle of the eyes, the soft tints of the complexions, the bright colors of the garments, and the deep shadows against which all is set, add charm to the picture and zest to the appetite and to the conversation. The dining-room may give upon a court, but if so the windows must be so arranged as to exclude unpleasant sights and noises; but it seems unnecessary to give to the dining-room a position of prominence equal to that of the parlor or living room, as is generally the case in the French apartment.

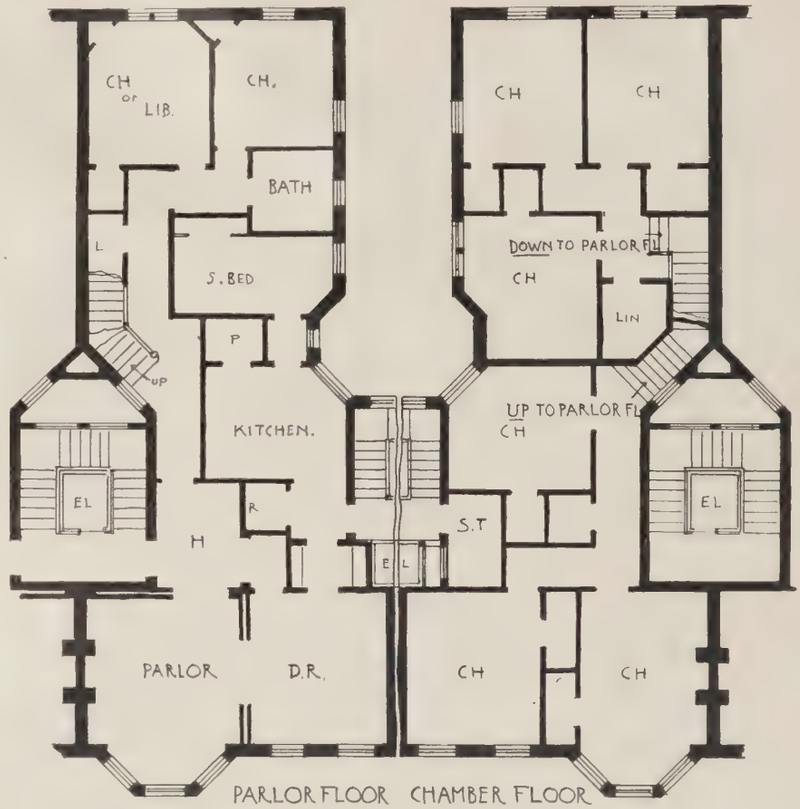
The kitchen should have a sunny aspect, and should be on the open air or on a well-ventilated court; and in either case the windows should be arranged so that the work going on within shall not be in evidence from chambers or other principal rooms on the same court. All well-planned apartments will have the ice chest in close proximity to the kitchen, but not so near as to get the kitchen heat. These refrigerators are attached to the building, and in many instances the chill is supplied from the ice machines in the basement, as the hot water is supplied to kitchen and toilet rooms and to plumbing fixtures in other rooms from the general hot water plant. Today no tenant would consider the kitchen complete without its gas or electric range, while for many years now, especially in medium-sized apartments, a laundry tub has been placed under the drip board of the sink making possible the laundrying of light articles at any desired time and without recourse to the main laundry.

That the chambers should be as sunny as is possible to plan for goes without saying, for no room can be considered perfectly wholesome and desirable as a sleeping apartment into which the sun does not at some time during the day freely penetrate. A general laundry with three tubs and a dryer should be provided for each three apartments at most, thus giving to each apartment the use of the laundry two days in each week.

The fuel gas for the laundry stoves and dryers goes through individual meters, each controlled from the kitchen of its respective apartment, so that the careful mistress of the apartment may see, by going to the kitchen, that the gas for which she is accountable is shut off when the laundry is not in use or when it is in use by other parties. This arrangement saves continual trips to the basement or the attic, in one of which localities the laundry is placed, when it is

not an individual establishment connected directly with the working portions of the apartment.

This last arrangement of course exists only in the most expensive and elaborately planned apartments. As to whether the laundries should be in basement or attic depends somewhat on other details of the plan. If air in free circulation abounds about a well-ventilated basement the laundries may well be placed there. If, however, the laundries open for ventilation on a narrow, deep court, on which chambers and principal rooms depend, then odors must come in course of time to be not a trifle obnoxious, and the laundries themselves become unwholesome. If the roof of the building is made a place of resort in hot weather as is attempted now, more or less frequently, then the attic is no place for laundries or odor-breeding compartments.

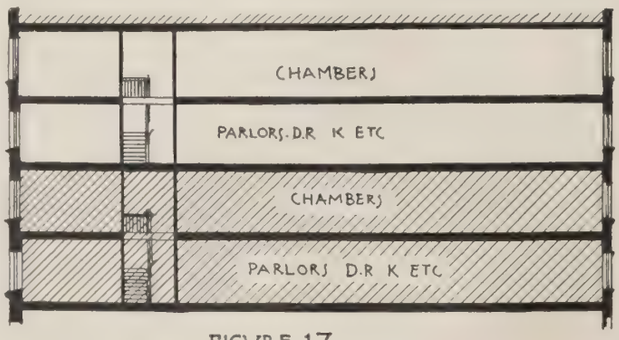


FIGVRE 15 FIGVRE 16

A servants' toilet room containing bath-tub, basin, and closet is the necessary adjunct of every well-planned apartment of more than medium cost. In the more moderate buildings these toilet rooms may be placed in the basement, or, better, off the stair landings of the servants' stairs and should be under the daily inspection of the janitor. From four apartments at most in which a single servant is employed, or from two apartments in which there are two servants, should one of these toilet rooms be accessible. Each and every apartment should have a good-sized storage room in the dry basement, and the walls of these rooms should be of tile or of solid plaster to prevent the spread of fire or vermin. Other and sufficient storage space should be provided in the apartment in the form of closets, cupboards, pantries, etc. The criticism never has been brought against an apartment that closets were too great in number or too ample in amount of storage space provided.

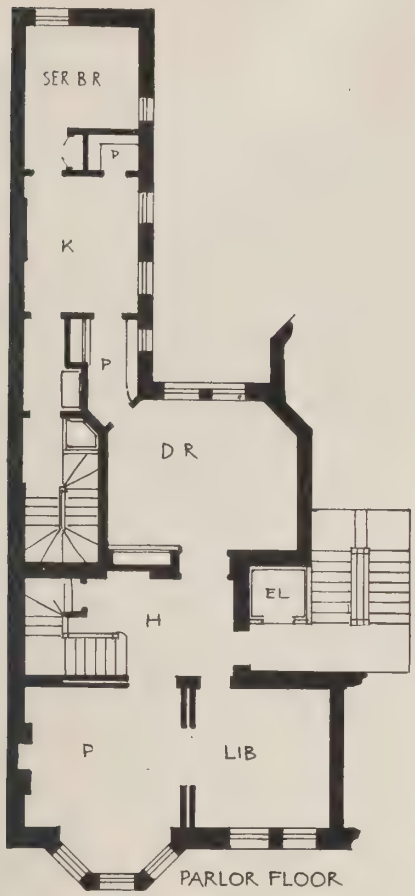
Probably the stable room which was wont to exist at the rear of the court of every French apartment building is transformed nowadays into a bicycle storage room. Sure it is that no apartment building in this country is complete without a conveniently located, easily accessible, and well-equipped room for the bicycles, which are as crying a need in the modern household as were babies in the olden.

The servant's bedroom has always been a matter for serious consideration. The most convenient place in most cases is near the kitchen, and in most plans opens directly into that room. It is better that an air lock should intervene, for kitchen odors, etc., are no more acceptable in a servant's bedroom than in a front chamber. At any rate, the servant's bedroom should be ample and so situated as to be easily and readily ventilated. The advisability of placing the servants from all the apartments in a building in a group by themselves is not yet determined. In France the *concierge* and his generally not numerous family occupy a small apartment at the street level, beside the carriage entrance to the court or near the main entrance door. The servants in many instances are quartered in the *entre sol*, a low story over the shops, which may occur along the street front, or over the stables which generally occupy the lower story at the rear of the court, or they are assigned to rooms in the attic story. As yet this method has not met high favor in this country, but it may have to be adopted as apartments become more luxurious and proportionately greater and higher class service is demanded. Undoubtedly, the necessity for more space than could be gained advantageously on one floor is responsible for the grouping of servants' quarters in a portion of the building remote from the apartments, as it is responsible for the grouping of laundries and storerooms in the basements or in the attics of our American apartment buildings. This same necessity gives rise to a scheme which has been put into practise, not altogether unsuccessfully in some instances, of giving considerably reduced height to the story in the portions containing the unimportant chambers and the kitchen arrangement, and thus getting an increased number of stories in that portion of the building as is indicated in section in Fig. 13. The difficulty with this scheme in general is that it requires a wasteful height of story in the main portion to get a respectable story or mezzanine in the rear, or it is apt to lead to an undesirable complication in plan and an awkward change of levels in corridors through which there is much service. A scheme which possibly is an improvement on this last, and which is especially adaptable to high buildings on shallow lots, is that of using a story and a half to each apartment, as is indicated in section in Fig. 14, and in plan in Figs. 15 and 16. The general advantage and the simplicity of the scheme are apparent with a little study of these figures. The chambers are entirely isolated, and all the rear chambers are quiet, being in a "stack" of chambers. The front chambers, to which one descends from the

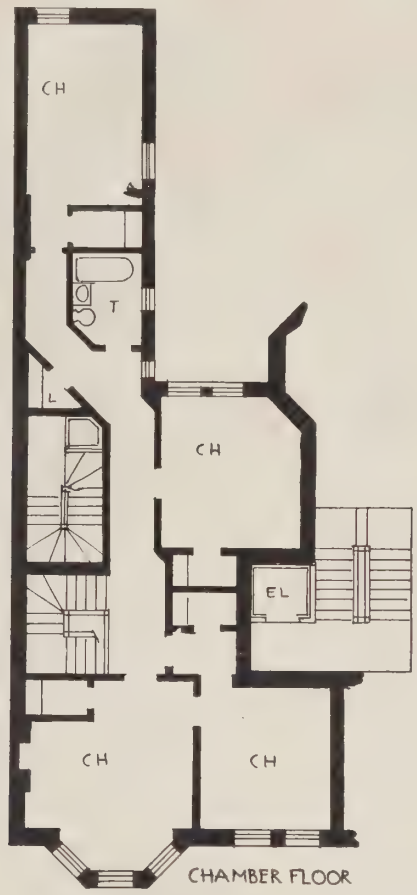


FIGVRE 17

main floor of the apartment to which they belong, are under the living rooms with which they communicate, and hence may be kept



FIGVRE 18



FIGVRE 19

quiet, as the noises which disturb in an apartment building are those which emanate from the story above.

The final and full development of the idea of using more than one floor for the accommodation of the rooms of one apartment is seen in section in Fig. 17, and in plan in Figs. 18 and 19, which show the living and chamber floors, respectively. The idea consists in using two entire floors for the same apartment, gaining all the advantages of the two-storied single house, and combining them with the general economy of service and the freedom from responsibility which are the main points afforded by an apartment.

It would seem that arguments in favor of the two-story scheme for apartments should be unnecessary where it can be applied economically to a particular location; but arguments have been made at times and have failed to convince. However, certain owners have recognized the advantages, and the general scheme has been employed. The especial plan presented in Figs. 18 and 19 has been used greatly to the advantage of itself and its neighbor in a scheme on a double narrow lot, as is indicated in Fig. 20. Here every im portant room in the building, including the janitor's quarters in the basement, gets sunlight, and all rooms, bathroom included, are on the free air of the street or of an ample open court. The combination of types gives prospective tenants a choice, and so gives added value to the property.

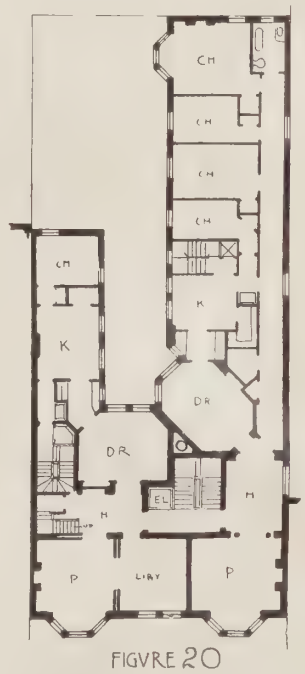
One structural matter now comes to the fore. It is an important matter which has not been overlooked, but which has been removed from its natural context so as the more to bring it in evidence, and it concerns the stairs and elevators. The stair shafts and the elevator wells of any apartment building, of no matter how few stories in height, should be of absolutely incombustible material; this applies to the servants' stairs as well as to the main stairway. This much may be realized in otherwise combustible buildings with little added expense, and the architect should insist on at least this much. But, better yet, each and every municipality should take the matter in hand and insist that every apartment building of over two stories in height erected within its borders should be of fire-proof — not merely "fire-proofed" — construction. The cost should not stand in the way; for even in this day of cheap wooden posts and studs the fire-proof apartment building will not cost more than from 10 to 15 per cent. in excess of the cost of the tinder-box construction. This should not be allowed to weigh against the value of life and neighboring property.

A matter of convenience which should be taken well into account is that of bells and calls from the living rooms and the chamber quarter to the kitchen or servants' quarter, wherever they may be placed, and from some readily accessible point in each apartment to the janitor's quarters. The development of the apartment beyond the bounds of the tenement or the mere "flat" renders necessary all the refinements of convenience which are to be found in every well-appointed house.

So far in this review of the development of the apartment building only more modest types have been presented, and of these only sufficient to illustrate the principles which underlie the planning of apartments generally. Nor does it seem necessary to present more elaborate examples, for the principles are the same, and once understood can be applied to any scheme, however modest or however elaborate. The difference is in degree and not in kind.

The apartment house problem is worthy of the mettle of the most talented architect, on the side both of reasonable and æsthetic planning, and of artistic handling of interiors and exteriors. The problem is more complicated than that presented in the design either of an office building or of a mansion, and comprehends the structural and economic questions involved in the one and the æsthetic possibilities inherent in the other.

The designer of the apartment building holds it in his power to make multitudes see the beauty of simple direct solutions of economic problems of every-day living, based on a sympathetic comprehension of what a refined home life may be, and also he holds the power to bring home to a great number of people by forcing a direct contact, an appreciation of the value of æsthetic surroundings in helping them to realize the ideal of living. This can be done, if by an architect, only by one who has added a mastery of the principles of planning and design to a deep appreciation of what is the real essence of a refined, contained, and sincere home life.



FIGVRE 20

THE Illinois Board of Examiners of Architects, after an examination, at the University of Illinois, at Urbana, have issued certificates to the following competitors, out of a class of eleven: William C. Swern, Chicago; Walter F. Shattuck, Chicago; Bernhard L. Hulsebus, Peoria; Albert C. Phelps, Joliet; Theodore W. Pietsch, Chicago; and William H. Schroeder, Chicago. This list is given in the order of merit marks.

COOPERATION BETWEEN ARCHITECT, ENGINEER, AND TERRA-COTTA MAKER.

BY THOMAS CUSACK.

THE CONSTRUCTION OF BALCONIES.

THE fundamental principles of composite construction as applied to balconies and other projecting members were reviewed at some length in connection with Figs. 52 to 56. Further examples are now given, in one of which (Fig. 57) a balcony of the conventional type is carried on its own brackets, supplemented by a very small amount of iron (or steel), and it of the simplest kind. The 4 by 4 in. cantilevers, for which provision is made in the joints, connect with a 5 in. I beam built into wall longitudinally. From this they have a purchase equal to the thickness of the wall, which, in the present instance, is 2 ft., the blocks themselves acting in conjunction with the wall as a fulcrum. These blocks, as in those of Fig. 55, are molded open on the top bed, and when adjusted to line on a temporary staging the chambers are filled with concrete. The whole platform is then floated off to required grade with about 1½ ins. of granolithic troweled to a smooth surface.

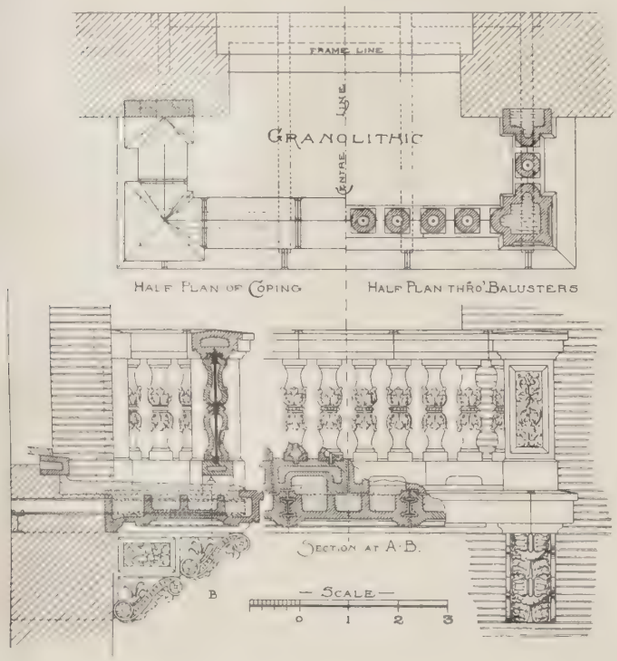


FIG. 57.

A platform constructed on these lines would be self-supporting under any weight likely to be placed upon it; even though the two brackets were taken away altogether it would stand in the case of a wall of that thickness. With them, however, 12,000 lbs. equally distributed would be considered a safe load for a balcony of the same general dimensions. The introduction of a steel triangle, such as is shown in Fig. 53, would be not merely superfluous, its presence would be decidedly injurious, in brackets of this character. Yet, we doubt whether the average engineer could deny himself the gratification of constructing one; two L's and a gusset plate having an almost irresistible charm for the modern man of iron. Facts, figures, and exact inferences are said to be his forte, but he has his weak points, nevertheless. One of these is his apparent inability to differentiate between a technical use of iron *per se*, and the modifications necessary when it is used as an auxiliary support in connection with a material of wholly different characteristics. With him, the exigencies of steel receive more than their due share of attention, while those of the terra-cotta remain a secondary consideration. Rightly understood, the two materials are coordinate in the order of their importance, and must be considered inter-dependent.

A terra-cotta bracket, such as that now before us, would be made with one horizontal partition, dividing the interior into two longitudinal chambers. By merely filling these chambers with good concrete, its strength would be materially increased. But, if a piece of I or T section is inserted (as at Fig. 54) and the concrete then rammed in so as to produce mechanical contact, the resulting bracket could be made stronger than the capacity of the wall from which it projected. We do not, of course, suggest that such additional strength is at all necessary in the one under notice, and for that reason nothing of the kind has been indicated in the drawing, but in many cases this will be found a simple expedient, and one which can be conveniently and effectively applied.

The tensile (or tortional) strength of a well-made terra-cotta bracket is much greater than is generally supposed. This statement will appear more explicit if taken in connection with a few of the many tests on which it is based. A cornice modillion made by the Northwestern Terra-cotta Company was tested in the manner shown at Fig. 58. Measured at the wall line it is 11½ ins. high, 8 ins. wide on face, with a projection of 2 ft. It carried a weight of more than 2 tons; but what the breaking strain would have been remains an unknown quantity, there being no more castings at hand wherewith to increase the load.

A much smaller modillion made under other conditions, by different men, from clay mined one thousand miles distant, was similarly tested at the works of the New York Architectural Terra-Cotta Company. It is but 5½ ins. high, 6 ins. wide at wall line, and has a projection of 14 ins. Allowing the same thickness of shell, this would be about half the sectional area, but with more than half the projection of Fig. 58. It was loaded in the manner shown at A, Fig. 59, until it broke at wall line under a weight of 2650 lbs. Another bracket pressed from the same mold was afterwards inserted where this one had been, and loaded to the extent of 2,400 lbs., which weight it has sustained for more than a month. It is still intact at date of writing.

The former of these modillions was slipped a cream white on a buff body, and is now used in the cornice of a building in Buffalo.



FIG. 58.

The latter was pressed from a clay which, when burned, is an excellent match for Indiana limestone. It was an over, left from a number used on the Delmonico Building, Fifth Avenue and 44th

Street, New York. No concrete filling or extraneous support of any kind was resorted to; the intention being to obtain the breaking strain of the bracket itself exactly as it came from the kiln.

A slightly larger bracket made of different clay was built into wall and loaded with pig iron, as shown at B, Fig. 59. It carried a

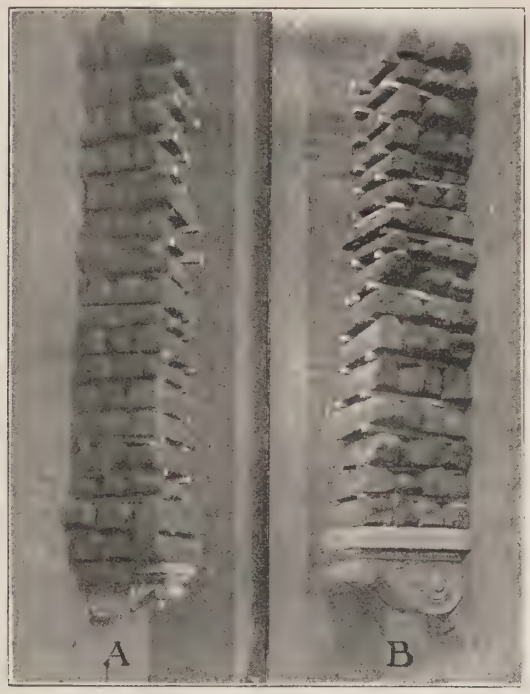


FIG. 59.

weight of 3,200 lbs., but its ultimate capacity could not be reached without endangering the wall from which it projected. This bracket was an over from the main cornice of the Citizens' Bank, Norfolk, Va., made from a clay mixture that burns to a light shade of red. Consols used under balconies being, invariably, much deeper, with at least three times the sectional area of these examples, could not be tested to their full capacity in the absence of special appliances. These comparatively slender cornice modillions were therefore chosen for the greater convenience of loading. The data obtained can, of course, be used as a basis on which extended calculations may be made. Other tests are contemplated and, if made, the findings will be communicated without reserve; but these, we think, are sufficiently conclusive, so far as the safe support of balconies is concerned. Meanwhile, the foregoing results, together with legitimate inferences to be drawn from them, are placed at the disposal of architects and engineers, for whose information these tests have been made.

It will be noticed that the balconies with which we have just been dealing are in connection with comparatively thick walls, a favorable condition of which full advantage has been taken. Archimedes was quite safe in his offer to lift the world on a lever, if anybody would but find him a place whereon to rest it. In like manner, we stand prepared to construct a terra-cotta platform, the carrying capacity of which shall be limited only by the thickness and weight of the wall from which it is projected. This proposal is less extravagant, but more capable of practical fulfilment, for, as will be observed, there is no *if* in it. Thick walls, however, are the exception in these days, and so we are forced to devise some way of dealing with walls in which steel columns and girders come within 4 or 8 ins. of the face.

An example of this kind is shown at Fig. 60, which, taken in connection with the engineer's skeleton (Fig. 61), will serve as a typical illustration of the class to which it belongs. Here the main columns of a fifteen-story building would not allow the consols to bond into wall more than 4 ins., an unfortunate, but it would seem unavoidable circumstance. Had this not been so, they would have entered the wall at least 16 ins. When properly anchored in that position there would then have been no excuse for the otherwise inevitable steel triangle. Even as it is, we think that this triangle might have been dispensed with, arrangements being made whereby the consol would have been bolted directly to the face of column. The gusset plate, at all events, could have been omitted. The diagonal strut would then have passed through a slot in the consol, connection being made with the longitudinal I beam before setting the egg and dart course between it and the top bed of consol. Considering the enormous tensile strength of the slender modillions under an eccentric load, as demonstrated in Figs. 58 and 59, some idea may

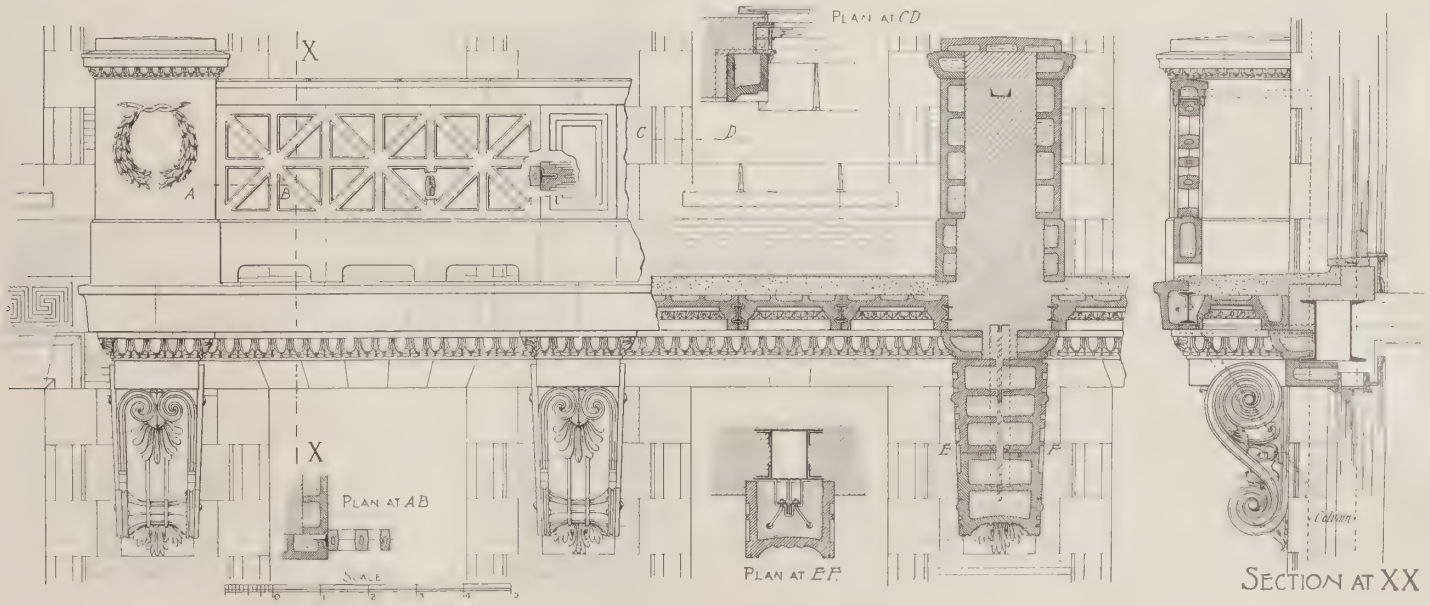


FIG. 60.

be formed as to the capacity of consols in which the conditions are reversed, and that on the side of increased strength. With little projection in proportion to its height the strain is changed from tortion to one of compression, 5 tons being a safe load for each consol.

This, we contend, would have justified the omission of the steel triangle altogether, allowing the platform to rest on the seven terra-cotta consols, which were spaced on rather less than 9 ft. centers.

As it is, these consols had to be slotted out from the back and when finally placed in position, the cavities on each side of gusset plate filled with cement. In this way they are, of course, rendered quite secure, but they would have been equally so, and in themselves much stronger, had the steel triangle been omitted, and the terra-cotta consol allowed to remain intact. Indeed, the undoubted strength of the steel triangle was very largely neutralized by the weakness imposed on the terra-cotta consol. In work of this kind the use of steel is permissible only in so far as it is absolutely necessary, and then in such way as will not make a sacrifice of the material it had been intended to supplement. Otherwise, we are merely adding strength with one hand and taking it away with the other.

The steel framing for a balustrade of this kind should be fitted together temporarily and have some of the connections made with bolts instead of rivets. This would admit of its being taken apart at will, and reassembled simultaneously with the terra-cotta, in such order of precedence as may be found most convenient at the time of setting. If the iron contractor allows his energies to get concentrated too closely on the completion of his own work, he is liable to forget that clay loses its plasticity once it has been burned. He should remember that though the most ductile of materials in its natural state, it becomes one of the most refractory when made into terra-cotta. Iron or steel, on the other hand, can be framed, forged, or welded to the required shape; and secured by either bolts or rivets, with almost equal facility. Other things *being equal*, the readiest and most economical method must always commend itself. But when a contracting engineer takes a short-sighted view of his own immediate interests he is very likely to lose sight of that qualifying condition. In such cases the terra-cotta manufacturer may have good cause to remind him of the frog's admonition to the boys, "What is play to you is death to us." It would, of course, be highly advantageous to all parties, if, in addition to its many good qualities, the clay could be molded around an unnecessary or, perhaps, prematurely fastened network of iron and then fired *in situ*. Until that can be done we would advise the next best thing: consultation and cooperation between the representatives of the iron and the terra-cotta contractors, the architect's decision being accepted on all sides as final.

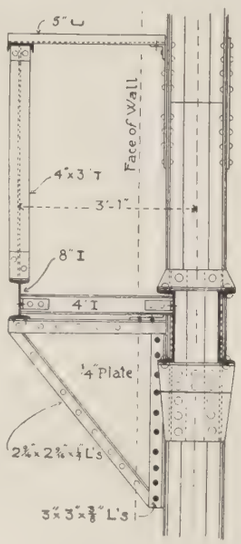


FIG. 61.

We have recommended the use of another material to which some of the preceding remarks do not apply; *viz*, cement concrete. Full advantage has been taken of its setting and adhesive properties in the construction of this and similar platforms. Let the open chambers be tamped full, the rough edges of the partitions taking hold of the matrix, and we have a monolith of great strength and durability. This work, with its surface of granolithic, should be done, preferably, by men well accustomed to the handling of cement. The problems of the age in which we live are in the hands of specialists; even the more scientific use of cement has grown into a separate industry. Those engaged in it are more likely to have men of experience, the right kind of material, and — which is equally important — improved mixing machines at their disposal. A combination of these is, in itself, a sufficient guarantee against surface cracking; the result of either poor material or poor workmanship — two things that seem to have a curious affinity for each other.

Fire-proofing.

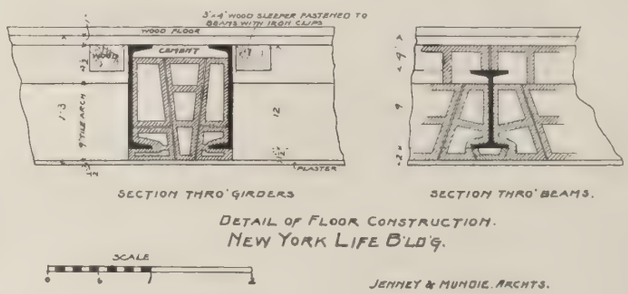
FIRE-PROOFING WITH BURNED CLAY.

BY W. L. B. JENNEY.

THE fundamental question is — What constitutes a good fire-proofing? First, it must protect the steel from becoming injuriously heated.

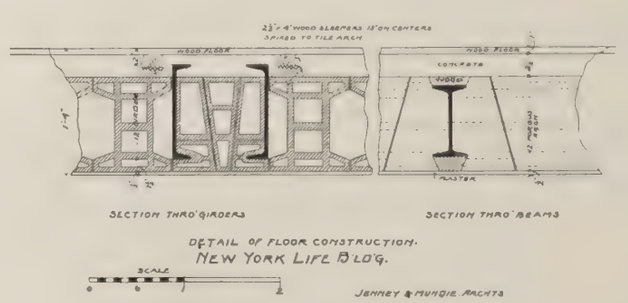
Second. It must be capable of resisting serious injury, both by the fire and by the fire department at the same time. There is a great difference in fire-proofing materials in this respect. There are some burnt clays that will readily stand the high temperature of the fire, and if allowed to cool slowly would sustain little or no injury, but will, if subjected to the dash and force of cold water while at a high temperature, suddenly contract and crack and be washed off. For example, in the Pittsburgh fire of May, 1897, the lower web of the floor arches scaled off, and many columns, and the lower flanges of beams, were partially stripped of their fire-proofing. The Board of Experts employed to examine the injuries to the building attributed the injury to the fire-proofing to other causes, such as movement of the building, with which I do not agree.

Fig. 1.



The writer had occasion to examine the injury to the side of the Schiller Theater after the burning of the adjoining building on the east. A part of the side wall exposed to the heat of the fire and to the water thrown by the fire department was of pressed brick — other parts of hollow fire-proof building tile. They were both affected alike. The outer 1 in. in thickness of the pressed brick and the outer web of the hollow tile scaled off and disappeared. Similar conditions obtained at the fire in the Athletic Club, Chicago.

Fig. 2.



The lessons taught by these fires are: —

First. The material must be such that it will successfully withstand at same time heat and water. There is plenty of such material. For example, the linings of coke ovens. When all aglow water is poured into the furnace from a 5 in. pipe without material injury to the lining. What is known as porous terra-cotta usually stands well if the clay is good. It is manufactured by adding six parts of

sawdust to four parts of suitable fire clay. The material can be easily tested by heating and plunging into water, which test should

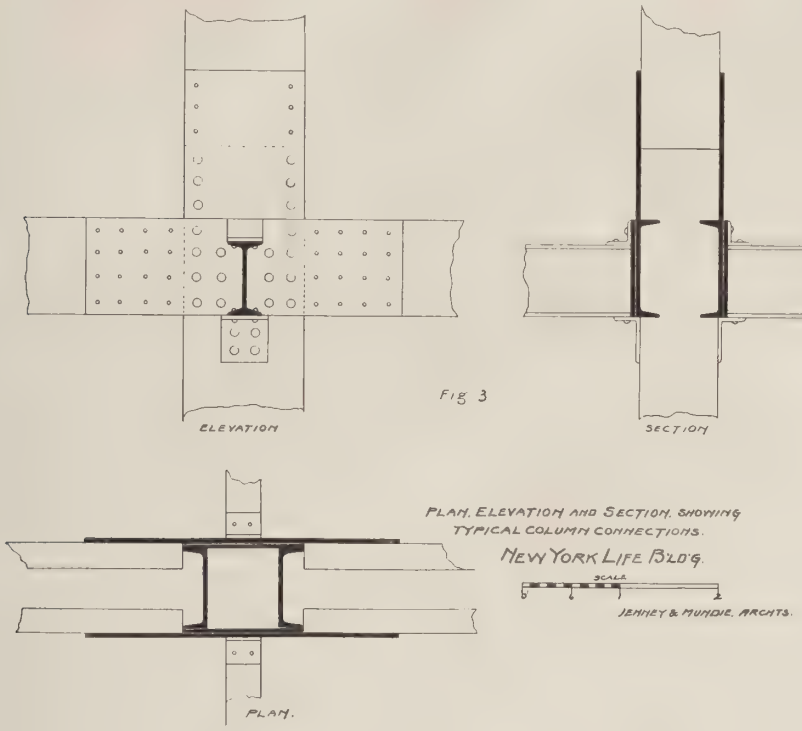


Fig 3

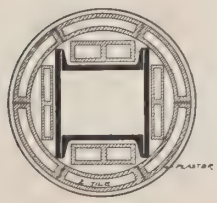
always be a part of the specifications, so there is no excuse for using an improper or defective material.

Second. Much care should be given to the shapes that they shall thoroughly protect the steel and be themselves thoroughly and substantially secured in place and protected from injury. The fire-proofing should not be liable to be washed off by the shock of the stream of water from the fire engines. To this end it is best to have smooth ceilings, that is, without panels, as the projection of the girders below the beams, paneling the ceiling, introduces an element of weakness in the lower flange protection of the girders that are not as firmly secured when they project as when they do not.

Figs. 1 and 2 are sections of the floor of the addition to the New York Life Building, Chicago. Two channels were used as the girder in order to secure a very rigid connection with the columns (Fig. 3) as all the wind bracing is thus provided for, doing away with the necessity of any other interior bracing, so difficult to manage without serious inconveniences. The interior fire-proofing of the double channel girders is by special shapes.

In Fig. 1, 9 in. tile arches were proposed. The sleepers to which the floor was nailed rested directly on the beams and were secured by steel clamps. Tile furring was proposed between the sleepers. Further study and discussion of the subject suggested Fig. 2, where a 12 in. arch was used, and in order to firmly secure the floor sleepers a strip of wood 1½ ins. thick was shaped and secured to the top flanges of the beams by steel clamps. To this strip the floor sleepers are spiked so as to be well secured and not liable to move by the usage of the floor, as has often been the case when the sleepers were simply bedded in the concrete over the arches.

Fig. 4



On presenting the two diagrams for proposals it was found that Fig. 2 would cost something less than Fig. 1, and as it was in all respects satisfactory, it was adopted.

For the protection of the columns Fig. 4 was used, every tile being thoroughly clamped to those above and below and around the columns. For a warehouse something more is required. Fig. 5 was used at the Fair, a great department store.

All the fire-proofing was set in a mortar composed of one part Portland cement and three parts best lime mortar, using only clean Lake Shore sand; all tile in dry weather to be wet before laying.

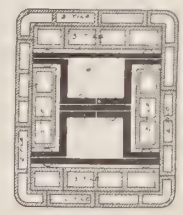
The concrete on the arches and between the floor sleepers is composed of one of Portland cement, three of clean Lake Shore torpedo sand, and four of aggregate; the aggregate to be composed of broken stone (other than lime stone), broken blast furnace slag, or waste brick or fire-proofing broken to go through 2 in. ring in all directions. This concrete to be pounded hard with a tamper weighing 40 lbs., with a cast-iron head 8 ins. by 8 ins. face. No cinders to be used.

The Pittsburgh fire showed the worthlessness of cinders in fire-proofing; they are consumed in a fire and offer no protection. Limestone would be burned to quick lime, would slack and destroy the concrete.

At a meeting of the Clay-Workers, Mr. Gates, president of one of our terra-cotta companies, offered a suggestion that can be made valuable for columns and for wall finish when terra-cotta can be used for the finish. "Make the terra-cotta the fire-proofing."

Here is an opportunity for a valuable innovation for exterior work and for the interior of a railroad station, a grand hall, etc., etc. The entire surface, however ornamental it may be, can be of terra-cotta that at the same time serves as fire-proofing. The material must be capable of satisfying the conditions of good fire-proofing material. It should be uninjured by heating to redness and then plunged into cold water. Great care should be taken with the anchorage that none of the pieces under any conditions that are likely to obtain can possibly be knocked off or put out of place.

Fig 5



Good fire-proofing must not only save the steel from injury, but should itself pass through the fire uninjured.

One of the lessons learned from the recent fires is that while the steel was substantially protected from injury the fire-proofing was itself destroyed, entailing a severe loss to the underwriters. This is not as it should be, nor is it a necessity, and should be avoided.

Most plastering is worthless after it has gone through a fire. Plaster of Paris is of itself worthless under the conditions of heat and water. It becomes permanently soft and washes away. Therefore no partitions of plaster of Paris blocks should be used; although they do not burn, they are destroyed in a fire and increase the loss. An excellent fire-proof plastering is coming into use; it is known as asbestic, and is composed of lime mortar to which a large proportion of asbestos is added at time of using. It can be hardened and improved by the addition of Portland cement. Further experiments should be made with this material.

THE British Fire Prevention Committee, embracing in its membership many of the leading architects of Great Britain, and which has for its main objects the use of its influence in every direction towards minimizing the possibilities and dangers of fire, and to bring together those scientifically interested in the subject of Fire Prevention, has issued, in pamphlet form, the paper, by Mr. Francis C. Moore, on "How to Build Fireproof," recently printed in these columns.

Masons' Department.

Mortar and Concrete.

QUALITY OF MORTAR.

NEARLY all of our modern masonry constructions, and certainly all brickwork, is built on the assumption that the individual blocks, whether brick or stone, are to be imbedded in a matrix of mortar, uniting the whole into a homogeneous mass. As a matter of fact this assumption is rarely perfectly correct, for the reason that the mortar, though forming the key to the strength of the whole wall or pier, and, consequently, of extreme importance as a factor in building operations, very often fails to receive the proper care, and a scientific knowledge of the properties of the material is often sadly lacking on the part of our builders. It is encouraging to notice, however, how much advance has been made in a comparatively few years in the uniformity of the product which is used in our more important buildings. The old-fashioned way of preparing mortar was to burn the lime in a more or less crudely constructed kiln, and to mix the materials as they were required on the job in small batches, the lime being partially slacked and then being immediately covered with a blanket of sand, theoretically to keep the heat in, but practically checking the thorough slacking of the particles. Then the mortar, whether with lime or cement as a base, was worked over by hand on a board close to the wall, and the brickwork was laid up with very little attention to anything except to get the material in place.

The necessities of modern building operations, no less than the scientific study which a few of our best builders have devoted to the subject, have resulted in a modern compound specifically known as machine-mixed mortar, which is so far ahead of the average product which we were formerly obliged to depend upon that, though it has not achieved perfection, and the results are not as good as were brought about by the Roman methods of centuries ago, it is a vast improvement over the average hand-mixed mortar. Unfortunately, this machine-mixed mortar cannot be obtained in all cities. It has been used a great deal in New York, and to a certain extent, we believe, in the other large cities, but as far as we know, it has not been found practicable to ship it to any great distance without increasing the cost over hand-mixed mortar; though if considerations of the quality of the work were to be put above a matter of a few cents per cubic yard in cost, it would be far better for the builders in our small towns to have the machine-mixed mortar shipped to them. The cost is claimed to be some twenty-five cents per thousand bricks less than the average cost of hand-mixed mortar, while it is claimed that an additional saving of twenty-two cents a thousand can be effected in the labor of laying the brick.

It is extremely satisfactory to feel that a good material, which is a decided improvement upon old methods, results not only in a better construction, but in a distinct saving of money. We should be inclined to look upon it another way and urge that even if the cost were thirty or forty cents more per thousand bricks, it would be well worth the difference to use machine-mixed mortar. This, of course, is on the assumption that the quality of the mortar is uniform and is kept up to high standard. It is much easier to do this mechanically than by trusting to manual labor. Any one who has watched the ordinary laborer mix mortar will undoubtedly appreciate how very variable the quality is. A bricklayer will try to judge of the mortar by the way it feels under the trowel. We know of one instance where an attempt was made to ascertain how much value could be placed upon such means of judgment. Three mixtures were made, one with two parts of sand to one part of Rosendale cement, the second with three parts of sand to one of cement, and half a portion of ordinary loam; the third mixture was one part cement, one part of loam, and four parts of sand. The color of the mortar in each case was so nearly the same as to be difficult to distinguish. Three bricklayers, to whom these batches of mortar were submitted, united in declaring that the one with equal parts of cement and loam was the best, their judgment being based simply upon the smoothness with which the mortar could be laid in the wall. There is no question but that if the utmost care were taken to thoroughly slack the binding material and to properly proportion the sand, giving plenty of time to the whole operation, hand-mixed mortar would be perfectly satisfactory in every respect; but such conditions rarely obtain in a large building, and by mixing machine-mixed mortar by the ton it is perfectly easy to maintain exact proportions, to have the binder equally strong in each case, and to have the intimate mixture of the components perfectly uniform.

There is another factor entering into the use of mortar, or perhaps, more properly, into the construction of masonry, which is liable to be overlooked. There is a saying among what we sometimes call the old-fashioned builders, to the effect that a wet building makes a dry house, or, in other words, that in a masonry construction, if plenty of water is used throughout, the bricks kept well wet, the joints thoroughly grouted, the result in the set of the mortar will be vastly superior to what one would expect from opposite conditions. This is, of course, especially true of work laid up with cement mortar, but it applies with very considerable force, also, to lime-mortar work. It is a common belief that in cold weather bricks should be heated before being set. We are not sure that this is the correct assumption. We have noticed a number of times that where bricks have been used hot the mortar, after a few months, is dry and crumbly under the hand, and has the appearance of having been frozen. It seems to stand to reason that hydraulic cement which requires a very considerable excess of water to set properly would have the life all drawn out of it by being set in bricks, which not only are free from water, but are heated so that they would absorb all the free water from the cement. It, of course, is not always practicable, on account of the cold, to wet bricks in winter time, but from personal experience we should be inclined to say that a wall would stand better if the bricks were laid up cold in winter than if the bricks were first heated. And certainly for any work in ordinary weather the liability is that it will be kept too dry rather than too wet.

We had occasion to notice a while ago an instance of the efficacy of the liberal use of water in this connection. In a certain prominent building in this city the door trim and the dado work were all constructed of Portland cement applied directly to fire-proof partition blocks. After the work had been run there came a spell of quite dry, hot weather, and the building was left open, with the result that when the cement work had the appearance of being dried out it was so soft and porous that it could be brushed away with a broom, and there was hardly any surface to it. The builder was shrewd enough to try some experiments before going to the expense of removing the whole. He stationed a number of laborers around the building with pails of water and big sponges, and instructions to wet the cement work down thoroughly and keep it wet. This treatment was continued for, if we remember rightly, some ten or twelve days, when the cement began to harden, and in a few days more it had set up in a perfectly satisfactory manner, and ultimately proved to be an exceptionally strong piece of work. We have no doubt that much of the poor mortar that is encountered in taking down old buildings owes its friability and seemingly poor texture to the fact that not enough water was used in the construction.

MATERIAL MAN.

THE Supreme Court of California holds that one who agrees to furnish certain mantels, tiles, and grates, and the appurtenances of same, for a building, and to deliver and set them in position, is a material man, and not an original contractor, within the meaning of the mechanics' lien law of that State.

The same court also holds, a person contracting to furnish doors, sashes, blinds, etc., which, instead of manufacturing to order, he purchased ready made, is a material man only.

Hydraulic Cements.

BY CLIFFORD RICHARDSON.

(*Continued.*)

Necessity of Keeping Cement Work Moist or Not. The necessity of keeping all work done with both kinds of hydraulic cement moist and supplied with water for a long time after setting, in order to aid in the hardening process and to prevent drying out and air cracking, is apparent.

It is found that the final strength which different cements attain in the process of hardening does not correspond at all to the celerity with which they first set. A quick-setting cement, which may show a great strength in a few hours, will not ordinarily compare, after the lapse of a month or more, favorably with one that is slow setting, while Portland cements harden much more rapidly than natural cements, although setting much slower. In this respect there is, however, a considerable variation in different brands, and those are usually considered most desirable which continue to harden after long intervals of time. For example, the American Portlands seem to gain most of their strength in a few weeks, while the German brands will, many of them, be inferior in strength to them at seven and twenty-eight days, but will continue to increase for nearly a year afterwards, and finally attain an equal strength. It is also worthy of note that there is a variation in the way in which cements, especially the natural ones, set throughout the mass, some hardening first on the exterior and others on the interior.

Effect of Variations in Composition in Portland Cement. Even within the narrow limits of composition for good Portland cements, already given, there is sufficient opportunity for variations to produce decided differences in character, some of which have been noticed. The set is much influenced by the amount of lime, especially when the cement is underburned, or by a large amount of alumina. As has been said, the more lime a cement contains the more difficult it is to bring about proper and complete combination in burning, and the higher the temperature and the longer the heat that is required. When perfectly made the high-limed cements are much slower in set, stronger and better for ordinary use, although they will not stand such immediate immersion in water as a low-limed cement will, and are, therefore, less suited for use where water is present. They are, however, most in demand for ordinary construction, and are especially satisfactory for sidewalks and work where a sufficient time must elapse before setting to allow of the placing of the material properly. Cements high in lime, which are not thoroughly burned or seasoned, are generally very quick setting, hot, and unstable, as are those which contain too much alumina or are over-clayed, as it is called. They have a tendency to expand and to blow or check, which is one of the faults of inferior Portland cement to be most carefully guarded against. The presence of magnesia is also supposed to bring about expansion after the lapse of a considerable period of time, while sulphates, as well as magnesia, are considered to be the causes of the disintegration of Portland cement in the presence of sea water.

Cements low in lime are sometimes found which, without an excess of alumina, but with more silica, are merely deficient in strength like underburned cement. A cement with 64 per cent. of lime is a highly limed one, with 65 excessively so, with less than 60 very low limed, and with 62 to 64 a normal cement. Alumina above 8 per cent. is high, below 5 very low. Magnesia above 3 per cent. is excessive, and above 2 high, while sulphuric acid above 1½ may demand consideration.

The amount of the two latter constituents ordinarily found in Portland cement can be seen in the following determinations in cements actually in the American markets during the past few years: —

Magnesia and sulphuric acid in Portland cements: —

Mgo.	SO_3
.86	1.25
2.79	.71
1.81	1.24
1.45	1.11
1.69	1.50
2.48	1.36
2.84	1.53
1.16	2.71
2.73	1.51
1.85	.39
1.32	1.82

Magnesia is usually below 2 per cent., and sulphuric acid not higher than 1½.

(*Continued.*)

STABLE SUBSOIL FOR FOUNDATIONS.

INVESTIGATIONS preliminary to the foundations of a large building are seldom made with sufficient thoroughness. Our readers doubtless will recall the famous epitaph on the tombstone of an architect who was buried in Westminster, which reads: —

"Lie heavy on him, Earth,
He laid great loads on thee."

The amount of the loads arising from a great building, and their effect upon not only the immediate soil, but upon the subsoil, is often more considerable than we are aware of. Furthermore, even with the best of soil the conditions are sometimes such as require especial provisions to guard against trouble. Some years ago an apartment house of considerable size was in process of erection in Brooklyn, upon a street in a newly developed portion of the city which had been laid out over a line of low mounds or hillocks, the streets having been cut down very nearly to a level, so that the finished grade was only a short distance above the bed rock, and the foundations of the building were even closer to the substratum. The earth in this case was of a clayey nature, and after an unusually heavy rain which was allowed to soak in around the foundations and get down through to the rock, the whole structure, building, foundations, clay bottom and all, proceeded to slide down hill and finally ended by landing in a heap in the middle of the street.

There is a great deal more movement of this sort than people are aware of. It has been stated on excellent authority that the whole southerly slope of Beacon Hill, Boston, with the buildings upon it, has been gradually sliding down into the water at a rate which is only a few inches a century, but yet quite sufficient to be appreciable; and as the section which it is alleged is in process of transit is occupied at points by some of the heaviest structures in the city, it may sometime become a question as to how far this species of loading can be safely carried when imposed, as in this instance, upon a sloping substratum of rock. In the more recent New York tall buildings it has been the custom to assume that the soil was worthless to resist the loads, and the foundations have accordingly been carried clear down to the bed rock. In Chicago, on the other hand, most of the large buildings are floated upon a relatively thin and by no means very firm layer of alluvial deposit. The Chicago buildings settle a good deal, the average Boston building settles slightly, and usually unequally, while the more recent New York buildings do not settle at all. The latter is obviously the best result, though also the most expensive.

SURETY LIABLE ON BUILDING CONTRACT.

A PROMISE by the surety of a building contractor, to whom the contractor had assigned the money to become due under the contract, to pay the claim of a subcontractor, if the latter would continue the work, is without consideration, unless the work specified was something which the subcontractor was not required to do by his contract, and is not binding on the surety unless it is in writing.— *Sup. Court, N. Y.*

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK. — The past month has been undeniably dull in this city, not only in regard to new building projects, but in every branch of the real-estate business. There is very little new work in sight, but no uneasiness seems to be felt by architects and builders, as both confidently hope for a brisk revival of business when peace is restored, and when other lines of business are as active as usual. We had hoped to see the demolition of the old reservoir at Fifth Avenue and 42d Street commenced this summer and work on Carrère & Hastings beautiful library building started, but there are no signs of it as yet, and probably nothing will be done during the Tammany administration. The Academy of Design, however, will be started at once, as it is not dependent upon the city for funds.

Among the new building projects might be mentioned: Dehli & Howard have prepared plans for a new building for St. Jerome Roman Catholic Church, to be built on 137th Street and Alexander Avenue; cost, $100,000.

McKim, Mead & White have planned a five-story brick and stone dwelling for W. E. D. Stokes, Esq., to be built on 54th Street; cost, $100,000.

W. Wheeler Smith has planned a two-story brick and stone structure to be erected on the Roosevelt Hospital grounds; cost, $30,000.

Rossiter & Wright are preparing plans for a four-story brick studio building to be erected on 34th Street; cost, $15,000.

N. Le Brun & Sons have prepared plans for a six-story brick structure to be erected on East 76th Street, for the Academy of the Marist Brothers; cost, $50,000.

E. H. Kendall has completed plans for the eight-story addition to the Methodist Book Concern, Fifth Avenue and 20th Street.

Hill & Turner are preparing plans for a ten-story brick and stone apartment house to be erected at Madison Avenue and 53d Street.

Cleverdon & Putzel have planned a five-story brick mercantile building to be erected at Third Avenue and 20th Street; cost, $60,000.

Carrère & Hastings are completing plans for a three-story brick and stone residence to be built at Morristown, N. J., for Abraham Wolff.

Ernest Flagg is preparing plans for an addition to the Singer Building, to be of brick and stone; cost, $400,000.

H. T. Howell has planned a seven-story brick flat and store building to be built on the Boulevard near 91st Street; cost, $80,000.

W. C. Dickerson has prepared plans for three four-story brick flats to be built on Wales Avenue; cost, $60,000.

James E. Ware & Son have planned a brick and stone flat building; cost, $25,000.

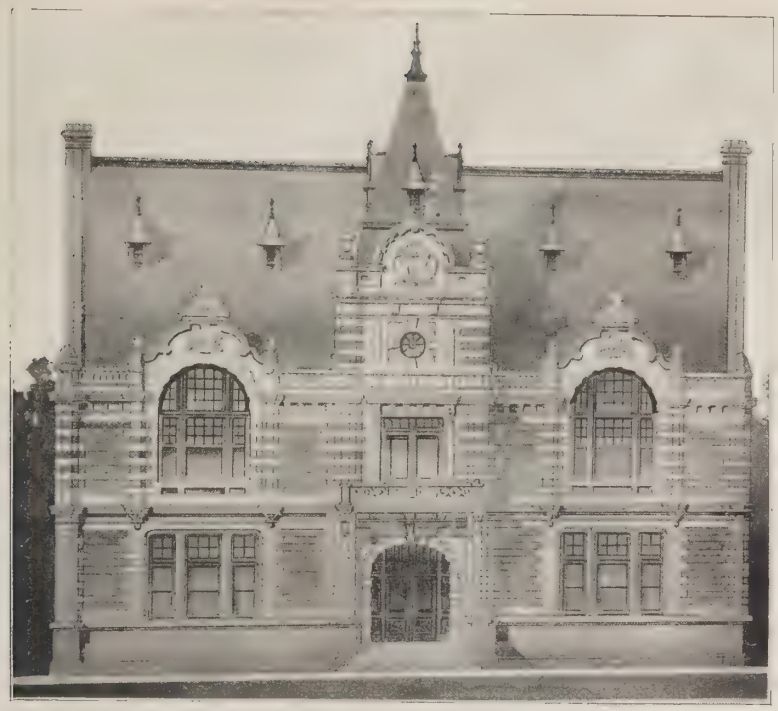
McKim, Mead & White have planned a six-story brick store and loft building to be erected at 300 Broadway; cost, $110,000.

CHICAGO. — Between war and the strikers Chicago architects are feeling blue. The cut-stone difficulty, described a month ago, was apparently settled by an acceptance of the old wage, — $4 per day of eight hours, and a minimum of four men instead of eight for every planer. But other troubles have arisen, and contractors predict that one will be unable to get even a plain sawed sill for a small residence. Another serious strike has been that of the wood-workers in sash and door factories. These have been among the last of craftsmen to succeed in organizing unions. Their present trouble seems to be settled.

The most remarkable strike that Chicago has seen is that of the stereotypers. It is notable because its result has been to prevent the appearance, for several days, of all the daily papers except the German publications. The publishers even closed their bulletin



PARK ROW SYNDICATE BUILDING, NEW YORK.
Photographed by Hall expressly for Central Fire-Proofing Company. Showing fire-proofing of domes and floors. This is the tallest office building in the world.
R. H. Robertson, Architect.



TOWN HALL, EAST ORANGE, N. J.
Details shown on Plates 49, 50, 51, 52.
Boring and Tilton, Architects.

boards, and Chicago people were wild for newspapers about the time Cervera's fleet was destroyed.

Another fire-proof mercantile or manufacturing building is announced. The building, designed by D. Adler, will cost $60,000, and be occupied by a wholesale tailor.

Shepley, Rutan & Coolidge have let contracts for a hotel at South Bend, Ind., the cost of which is given at $223,000. The building is steel frame and tile-arch construction. The exterior is Renaissance in design. The first story is stone, but the other five are brick with terra-cotta window trimmings, cornice, etc. The Chicago Hydraulic-Press Brick Company and the American Terra-Cotta and Ceramic Company are to provide the brick and terra-cotta.

An interesting alteration job is that of the Studebaker Carriage Depository on Michigan Avenue. By September this ten-story building will have been transformed (under the hands, very properly, of its original architect, S. S. Beman) into "The Fine Arts Building." There will be two music halls — one to seat 1,600, the other 700, and an assembly hall to accommodate 500. The building is intended to be a center for art, educational, and literary interests,



"THE FAIR" BUILDING, CHICAGO.
Exterior of terra-cotta bricks furnished by the Columbus Brick and Terra-Cotta Company.
Jenney & Mundie, Architects.

and is renting space to prominent sculptors and painters, to publishers like Harper & Bros., and D. Appleton & Co., and various periodicals, and to musical and art clubs.

Five hundred Chicago architects have paid each his $25 for a license, and now as each answers the call for his first annual $5 fee he sympathizes with the builder contractors who have to pay a like annual license fee. The plumbers, however, have to pay $30 per year, and at a recent date 800 out of 1,000 master plumbers were delinquent.

PITTSBURGH.— The general idea that almost nothing is being done at present in the building line does not seem to be confirmed by the report of the building inspector. While there are very few office or store buildings either in process of erection or being contemplated, the inspector reports that the number of permits for new buildings in June have increased 27 per cent. over those of 1897, while the valuation has increased over 43 per cent. As compared with last month, they have fallen off one in number but increased in valuation 10 per cent. This would indicate that a better class of dwellings are being built, and it is gratifying to note a large decrease in the number of frame buildings even in unrestricted wards, the majority being brick houses of from about ten to fifteen thousand dollars value.

Among the most important building news items at present are: The new six-story store and office building at the corner of 6th Street and Liberty Avenue. It is to be built of light sandstone and Roman brick, and cost $130,000; James T. Steen, architect. The new Kaufmann store on Smithfield Street, of stone and gray Roman brick; cost, $175,000; Charles Bickel, architect.

The new building for C. L. Magee, on Fifth Avenue, near Wood Street, is being built from plans by F. J. Osterling. The front is almost entirely of light-gray terra-cotta.

Alden & Harlow have recently let the contract for the Wylie Avenue branch of the Carnegie Library. It is to be built of brick and red sandstone, and cost, complete, about $40,000.

Among residences recently completed is that of Mr. A. M. Byers, in Allegheny. Although a double house, it is built to resemble a single house; cost, about $175,000.

The J. G. Jennings house on Fifth Avenue, East End, has also recently been finished; built of buff Roman brick and light terra-cotta; cost, $40,000. Alden & Harlow are the architects of both.

Boggs & Buhl are making a large addition to their department store in Allegheny. S. F. Heckert is the architect. Though constructed with a steel frame, wooden joist twelve inches apart are being used to support the floors,



TERRA-COTTA COLUMN, CHAMBER OF COMMERCE, CLEVELAND, OHIO.
Executed by the Northwestern Terra-Cotta Company.
Peabody & Stearns, Architects.



TERRA-COTTA CAPITAL, OFFICE BUILDING, HOLYOKE, MASS.
Executed by the Standard Terra-Cotta Company.
Clough & Reid, Architects.

and have caused the writer to wonder whether the difference in insurance between this construction and that of a fire-proof floor would not in a few years have paid the difference in cost between the two constructions.

Geo. S. Orth & Bros. are at work on a brick residence for Col. A. J. Logan, on Fifth Avenue, East End. They have also prepared plans for a brick residence for W. L. Jones, on Forbes Street; cost, $25,000; a stone residence for W. A. Shaw, to cost $30,000; four houses for E. B. Alsop, to be built on Ellsworth Avenue, East End,



WATER TOWER, CHAPINVILLE, CONN.
Stone, Carpenter & Willson, Architects.



THE CONVERSE BUILDING, BOSTON.
Terra-Cotta furnished by the Excelsior Terra-Cotta Company. Face brick by the Sayre & Fisher Company.
Winslow & Wetherell, Architects.

and cost about $75,000; also for five houses for the Aiken estate, each to cost about $6,500. They have also recently let the contract for a stone residence for Miss Alice Hogg, to be built in Homewood; cost, $25,000.

J. C. Westervelt, of New York, has made plans for a brick colonial house for W. S. Kuhn, to be built on Forbes Street; cost, about $40,000.

F. J. Osterling is at work on the new insane asylum for Allegheny County, to be built at Woodville; cost, $200,000. He is also preparing plans for the new building for the Chautauqua Lake Ice Company. It is to be a brick, fire-proof building, 100 by 225 ft.

A competition has recently been held for a new twelve-room school building in the 22d Ward, but is, as yet, not decided.

CURRENT ITEMS OF INTEREST.

WALDO BROTHERS have been awarded the contract to furnish Atlas Portland cement to the town of Concord, Mass.



TERRA-COTTA DETAIL.
Executed by Gladding, McBean & Co., San Francisco, Cal.



TERRA-COTTA DETAIL, MT. VERNON HIGH SCHOOL, MT. VERNON, N. Y.

Executed by the Conkling, Armstrong Terra-Cotta Company.
Poring & Tilton, Architects.

NORCROSS BROTHERS are using Meiers Puzzolan cement in backing of light stonework at the Radcliffe Gymnasium, Cambridge, Mass.

THE CUMMINGS CEMENT COMPANY, of Akron, N. Y., is furnishing their Storm King Portland for the fire-proof building now being erected by John Druecker, of Chicago.

WALDO BROTHERS are furnishing Alsen Portland cement to the Roebling Company for use on floors for Somerset Hotel, Boston, Mass.

THE AMERICAN CEMENT COMPANY, who have four works at Egypt, Pa., and one at Jordan, N. Y., have recently made shipments of cement to Siberia, and also to Mexico.

SAYRE & FISHER COMPANY are supplying through their Boston agent, Charles Bacon, ivory cream enameled bricks for the new swimming tank in Craigie Hall, Harvard College; Miss Josephine Wright Chapman, architect.

THE EXCELSIOR TERRA-COTTA COMPANY, through their Boston agent, Charles Bacon, is supplying the architectural terra-cotta for the new Home for Aged People, Cambridge, Mass.; Stickney & Austin and W. E. Chamberlain, associate architects.



CLOISTER (SHOWING GUASTAVINO CONSTRUCTION), ST. CHRISTOPHER MISSION HOUSE, NEW YORK CITY.
Barney & Chapman, Architects.



THE NEW CATLIN BLOCK, HARTFORD, CONN.
Hollow brick used in this building supplied by the C. P. Merwin Brick Company, Berlin, Conn. Terra-cotta by the Excelsior Terra-Cotta Company, through their Connecticut representative, W. P. Felt, New Britain, Conn.
W. C. Brocklesby, Architect. Hopkins & Roberts, Builders.

H. F. MAYLAND & CO., New York agents of the Burlington Architectural Terra-Cotta Company, have closed the following new contracts: Graphic Building, Fourth Avenue, New York City, Wm. J. Dilthey, architect; apartment house, 34th Street, New York City, George H. Van Auken, architect.

THE work of rebuilding the plant of the Illinois Supply & Construction Company, at St. Louis, recently destroyed by fire, is progressing in a very rapid and satisfactory manner. No inconvenience has been caused in the matter of filling contracts that they had on hand at the time of the fire, as plenty of bricks were left them uninjured.

THE BRICK, TERRA-COTTA AND SUPPLY COMPANY, M. E. Gregory, proprietor, Corning, N. Y., has been awarded the contract for furnishing the paving brick required for paving Main Street, Geneva, N. Y. They also have the contract for furnishing the architectural terra-cotta required for Telephone Building, Wheeling, W. Va., Rutan & Russell, architects.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY, Burlington, N. J., have received the following new contracts: residence, 33d and Diamond Streets, Philadel-

phia, H. E. Flower, architect; Holy Cross Church, Ninth and Lehigh Avenues, Philadelphia, Isaac Pursell, architect; new building, Zoological Garden, Philadelphia, Hewett Brothers, architects.

THE CELADON TERRA-COTTA COMPANY, LTD., will furnish their roofing tiles on the following new buildings: residence for H. T. Chandler, Cleveland, Ohio, A. N. Oviatt, architect; Science Hall, Syracuse University, Prof. Edward H. Gaggin, architect; residence for E. W. Swisher, Columbus, Ohio, C. A. Stribling & Co, architects; office building for International Bridge Company, Niagara, N. Y., R. H. Wallace, architect; residence B. W. Kauffman, Yost & Packard, architects; station for C. R. I. & P. R. Railway, Iowa City, Iowa, W. K. McFarlin, architect; station for same company at Atlantic, Iowa, W. K. McFarlin, architect; residence for W. H. Ensinger, St. Paul, Clarence H. Johnson, architect; Somerset Apartments, Boston, Arthur H. Bowditch, architect.

AMONG the recent contracts executed by the Berlin Iron Bridge Company is a new boiler house for the People's Light and Power Company, Jersey City, N. J. It is of fire-proof construction throughout with steel framework, brick side walls and iron roof covering; a new scrubber house at the 25th ward gas works; a new boiler and engine house at the Point Breeze Works; also a condenser and purifier building at the same location, all for the United Gas and Improvement Company, of Philadelphia, Pa. These buildings are of steel-frame construction, brick side walls and slate roof supported on metal purlins carried by clear span trusses; new buildings for the electric railroad plant of the Syracuse Construction Company, at Syracuse, N. Y. These buildings are all of steel framework covered with corrugated iron.

THE following new buildings have been furnished with the Shawnee brick manufactured by the Ohio Mining and Manufacturing Company, through their Pittsburgh agents, Burgy & McNeill: residence for W. A. Roberts, Pittsburgh, D. B. Morris, architect; Borrows Apartments, Pittsburgh, T. H. Scott, architect; residence for T. W. Bithell, Pittsburgh, A. K. Miller, architect; McGee Building, Pittsburgh, F. J. Osterling, architect; store building for Geo. W. Driver, Washington, Pa., John Vester, architect; residence for T. S. Morgan, Bellevue, Pa., E. M. Butz & Co., architects; residence for H. Robbins, Pittsburgh, Sidney Heckert, architect; two residences for J. H. Elder, Pittsburgh, Victor E. Kelley, architect; public school, Wilkinsburg, Pa., E. M. Butz & Co., architects; public school, Charleroi, Pa., E. M. Butz & Co., architects; Katterburg Building, Pittsburgh, E. B. Milligan, architect; Murtland Building, Pittsburgh, Alden & Harlow, architects.

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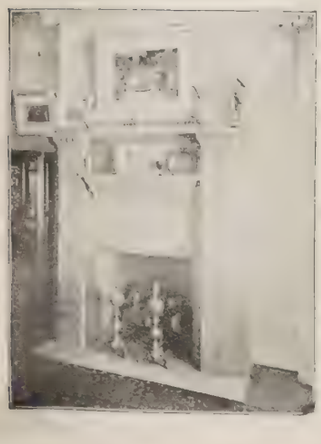
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The Celadon Terra-Cotta Co., Ltd.,

MANUFACTURERS OF

ARTISTIC ROOFING TILE,

ALFRED, N. Y.

(Under Babcock Patents.)



RESIDENCE OF JUSTICE H. B. BROWN, WASHINGTON.



RESIDENCE OF D. J. HUBBARD, CHICAGO.

Each of the houses shown in the above cuts is covered with our Gothic Combination Tile, described in the last issue of this publication. Their appearance has created favorable comment in each city.

Of late years there has been much complaint on the part of architects because they could not get a red slate of good quality and uniform color for work where they wanted to secure a red roof of durable character, and could not use roofing tiles, owing to their greater cost.

We are now able to offer to the architects of the country a thoroughly

VITRIFIED RED ROOFING TILE,

delivered anywhere in the United States

FOR THE PRICE OF BEST QUALITY RED SLATE,

in any one of the following patterns.



NEW YORK OFFICE,
SUITE 1123-4, 156 FIFTH AVENUE,
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SUITE 1001-2, 204 DEARBORN STREET,
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THE DELMONICO BUILDING, 44TH STREET AND FIFTH AVE., NEW YORK CITY.

JAMES BROWN LORD, ARCHITECT

TERRA-COTTA AND BRICK BY THE

NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY,

PHILADELPHIA. 38 PARK ROW, NEW YORK CITY. BOSTON.

VOLVME VII AUGUST 1898 No. 8

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

ROGERS & MANSON,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

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PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connection, editorial or proprietary, with this publication.

THE BRICKBUILDER is published the 20th of each month.

CONCEDING the proper object of this journal to be the encouragement of the best work in brick and terra-cotta, and with a view of presenting in concrete form embodiments of the principles which we have urged in these columns, we begin with this number of THE BRICKBUILDER the publication of a series of articles dealing with the designing and construction of a ten-thousand-dollar private residence. The first of the series is contributed by Mr. Charles A. Rich, the well-known architect of New York. It will be followed by similar articles by some of the leading architectural minds of the country, and the series will present the views of the profession as to the possibilities of brick and terra-cotta as applied to residences of moderate cost and dimensions. Our brick and terra cotta manufacturers have of late years given a great deal of attention to devising means for bringing their products prominently before the people in order to create a large demand of their wares, and to accomplish this they have sought the advice of architects and constructors and have adopted all of the well-known methods of properly advertising their products, some of the manufacturers having issued some very excellent monographs illustrating brick and terra-cotta architecture and its possibilities. All of these have had their use and have been fruitful in results, but we feel a special pride in the possibilities within the reach of this journal to call out and present the ideas which this series of articles will embody. It is the kind of encouragement of brick architecture, *per se*, which we believe will be most efficacious not only in developing the fact that brick can be used most advantageously under certain circumstances, but in going beyond this and showing specifically how it can be a factor in a thoroughly artistic as well as practical dwelling. The best way to encourage an art is to practise it. Ideal solutions are often in a general sense of more value than actual illustrations of existing work, and this series will correspondingly show how the thoughts of some of our best architects can find a fitting expression in the materials which are peculiarly ours to foster.

We cannot forbear offering just a bit of advice to our brick manufacturers in this connection. The advice has nothing to do with the size of the brick, its particular composition, nor the exact shade or coloring, all of which are matters which are capable of almost endless discussion and often with little real satisfactory result; but the most artistic dreamer as well as the most sternly practical constructor will agree with us that the best recommendation for a particular style of brick is to have it used in a thoroughly successful building, successful not as a matter of mere size nor as regards prominence of location, but successful in the artistic, beautiful lines which appeal so strongly to the architect, and which, as the years increase our measure of popular appreciation, will appeal with increasing force to the great mass of people who live in architect-built houses. So that our advice would be to the salesman who is seeking to have his bricks most approved by the public, to take pride and advertise the successful buildings from an artistic standpoint, to claim excellence of result rather than mere fineness of product, and to measure success by the artistic worth of the buildings in which the brick may become so integral a portion. The question of price is one which will adjust itself, the question of artistic result is one which has to be adjusted, and in proportion as good brick houses are built, in that proportion will good bricks be appreciated.

THE lack of color in our modern architecture is often commented on, and we frequently hear expressed the hope that a more consistent and general use of color might prevail in our street architecture. Color is, however, almost a closed book to many architects, and the reason for this, we believe, is very largely timidity and a fear of spoiling the particular building which engages the attention. Timidity, however, never built great monuments nor led the way to any advance, and if we are to do color we must stop talking about it and get to work and do it. It is not every one who has a distinct eye for color, and it is not always possible to reason out in advance a scheme of applied color which will be successful. In this connection we are reminded of a most excellent designer whose chief title to fame was his ability to work out an uncomfortable corner or to straighten out an entangled bit of design. Indeed, it used to be said that he never could do a thing right until he had done it wrong first and got it all snarled up. Now that kind of reasoning applied to color is illogical, we admit, and of doubtful success as compared with the spontaneous conceptions of the true colorist, but for the average practitioner it is far better to plunge in boldly, make a mistake in his colors and then by using a little reason try and straighten them out, rather than to yield to the timidity which would lead him to abandon striking combinations entirely and adhere to the commonplace. For instance, let one of these timid designers some day try an experiment. Suppose he has a terra-cotta front, let him somehow put a great blotch of green right in the center. As he has got it there he has got to make it good looking, so the next step might be to put right alongside of it a brownish yellow; and if the green is a bright emerald-green hue such as we sometimes get in the

terra-cottas, let him put just a faint dash of purple between the yellow and the green and he will have a combination which he will have to use his wits to get out of. The chances are that it will be thoroughly bad; but by remembering the simple fundamental laws of harmony and contrast in color, remembering that in a general way red complements the green, and purple the yellow, and blue the orange, and by making a few studies in pastels, it would be very strange if he couldn't pull himself out of that combination with a result which ought to yield some very interesting and, after a few trials, valuable color effects. At any rate, after a man has done this once or twice his worst enemies would never accuse him of timidity, and if he didn't succeed in making a success of the combination he can, at least, console himself with the feeling that some other wayfarer, seeing his failure, might take heart, try again and do it better, all of which may not be particularly consoling to the owner who has employed the essayist, but it would be a step towards what we are all looking for, color in our buildings. If any one should undertake to analyze most any of the really successful architectural color effects, such, for instance, as the Della Robbia frieze on the Pistoja Hospital, it would be seen that the very colors which we have enumerated here are used in juxtaposition and that the unity is brought about by what is added after these had been thrown in; and though, as was said before, the best way is to feel the color in the beginning, to do it naturally and let it be *sui generis*, he who has not that endowment need not, therefore, content himself with the commonplace monotones. A friend of ours taught his son to swim by tying a rope around his waist and throwing him into the Mississippi from the deck of a steamboat. The boy learned to swim very promptly. A similar treatment of self-immolation on the part of our timid designers would very speedily give us, at least, the prospects of some strong colorists.

THE aggregate fire loss in the United States for 1897 was $2,454,592,481, which is $2,382,845 less than in 1896. The insurance loss for the year was $1,438,902,448, or $7,181,655 lower than the loss for the previous year. This showing is smaller than for any year since 1890. A noticeable feature is that for the first time the yearly loss of New York was exceeded by that of another State, Pennsylvania leading with a fire loss of $13,706,315, and an insurance of $8,674,980.

The number of fires reported during the year was 55,779, of which but two caused a loss of over $1,000,000. One was at Knoxville, Tenn., in April, where the figures footed up to $1,019,725, and the other was at Pittsburgh, Pa., in May, when the loss was $1,905,515. The loss to the State of Pennsylvania on the buildings at Harrisburg aggregated $700,000. The greatest monthly loss occurred in January, when the property loss was $11,594,495, and the insurance loss $7,187,515.

There were burned in 1897, 33,033 dwellings and tenements, 11,811 barns, stables, and granaries; 1,753 general merchandise stores; 913 retail liquor stores and saloons; and 735 churches.

PART of the $50,000 asked for by the National Academy of Design, in recent appeal to its friends for aid in the erection of the school portion of its new home on Morningside Heights, New York City, has been subscribed, and it is confidently expected that the balance will be raised soon. The architects, Carrère & Hastings, have estimated that the new academy, if built of the finest material in the best manner, would cost not less than $800,000, and the academy has only about $200,000 to meet this demand. It has been decided to erect the school portion of the building first.

THE Chicago Architects' Business Association has prepared and copyrighted a full set of forms of contracts, certificates, waivers of lien, and other blanks, in accordance with the provisions of the mechanics' lien law of Illinois. These blanks were carefully prepared by a special committee appointed by the association, and are believed to meet every exigency of the lien law and the conditions of building in that section.

COMPETITIVE plans for the $350,000 addition to the Ohio State House were submitted by Yost & Packard, of Columbus; H. A. Linthwaite, of Columbus; George F. Hammond, of Cleveland; Samuel Hannaford & Sons, of Cincinnati; and H. C. Lindsey, of Zanesville. The plans of Samuel Hannaford & Sons, of Cincinnati, were accepted. The structure will be completed in eighteen months.

AT a meeting of the Executive Committee of the American Institute of Architects held in New York, July 21, the following persons were elected as Fellows of the Institute: Charles I. Berg, Albert L. Brockway, New York City; William H. Conway, Springfield, Ill.; Herbert W. Foltz, Indianapolis, Ind.

BY operation of section 11 of the license law, nearly one hundred architects in Chicago, and thirty more in the State at large, having failed to renew their licenses during the month of July, have had the same revoked by orders of the State Board of Examiners of Architects on the first day of July, 1898.

THERE will be 60,000 sq. ft. of white enameled brick arches on the under side of the midway floor of the new Southern Union Station, Boston, requiring in their completion 400,000 of the finer quality of brick, and 600,000 of the commoner kinds, in all a round million. Where the roof has been covered in the work of setting the arches has been started.

ILLUSTRATED ADVERTISEMENTS.

IN the advertisement of Fiske, Homes & Co., page vi, is illustrated one of a number of mantels which they have just finished for the new Ranleigh Chambers, Boston.

The Conestoga Building, Pittsburgh, Pa., Alden & Harlow



CARTOUCHE FROM THE PAVILION BUILDING, BOSTON.
Executed by the New York Architectural Terra-Cotta Company.
Burr & Sise, Architects.

architects, is shown in the advertisement of Harbison & Walker Company, page xv. Two residences, one of Justice H. B. Brown, Washington, the other of D. J. Hubbard, Esq., Chicago, are shown in the advertisement of the Celadon Terra-Cotta Company, page xxvii.

The American Schoolhouse. X.

BY EDMUND M. WHEELWRIGHT.

THE Mechanic Arts High School in Boston was begun in 1893. It was not at first fully completed, and the addition originally contemplated for this building is about to be built. This addition, with certain changes in the original structure, will complete it with all the features shown in the plans here published.

The following description of the plan and appointments of the building is based upon that given in the last report of the master, Dr. Charles W. Parmenter.

The boiler room, coal room, engine room, and engineer's store room are in the basement. Here, also, are the principal toilet rooms and dressing rooms containing the clothes lockers, each of which is 23 by 18 ins. in plan and 5 ft. high; the floors and tops of these lockers are of stout wire netting. The doors have panels of the same netting and are fitted with combination locks. In one of the dressing rooms is the lunch counter. The forge shop is also in the basement.

On the first floor are the office of the master with lobby for visitors and library adjoining, chemical laboratory and room for chemical stores; two school rooms, each accommodating seventy pupils; three recitation rooms, the machine shop, the metal-working tool room, storage room for metal stock, office for the instructors in metal work, and a private room for men teachers.

On the second floor are the physical laboratory, with teachers' laboratory, and store room and dark room adjoining, private room for women teachers; two school rooms, identical with those on the first floor, two wood-working rooms for first-year pupils, the carpentry tool room and room for preparation of wood-working stock, and the finishing room.

On the third floor are three drawing rooms, two school rooms, a large recitation room, storage room for drawing materials, wood-turning and pattern-making room, a modeling room, and a toilet room. The drawing room at each end and the adjacent school room are separated by flexible doors so that the two rooms may be thrown together to furnish an assembly hall for occasional use.



THE MECHANIC ARTS HIGH SCHOOL, BOSTON.

Each of the drawing rooms has accommodations for six classes of thirty-six pupils. Each drawing table is fitted with a locker which holds six half-imperial drawing boards. The six drawers on the right contain the personal property of each pupil. In drawers above the locker are placed the drawing instruments furnished by the school board.

Over the teacher's platform in each drawing room, in addition to the slate blackboard on the wall, is a set of three movable blackboards placed one directly in front of another, and each hung by counterbalanced weights. In the rear of the larger room are the sink and racks for washing and drying blue prints.

Two adjoining rooms on the second floor are assigned to the department for wood-working with hand tools. These rooms are equipped for six classes of thirty-six pupils. Each room is furnished with eighteen double benches, 57 ins. long, 45 ins. wide, and varying in height from 29 to 33 ins. On either side of these benches is a tier of three drawers, one of which is assigned to each pupil, for the set of cutting tools with which he is supplied. Here, also, is kept his apron and unfinished work. Dividing the top of the bench in the center is a vertical tool board 9½ ins. high. At the ends of the bench, upon hooks and shelves, are kept the measuring and miscellaneous tools used in common by members of different classes.

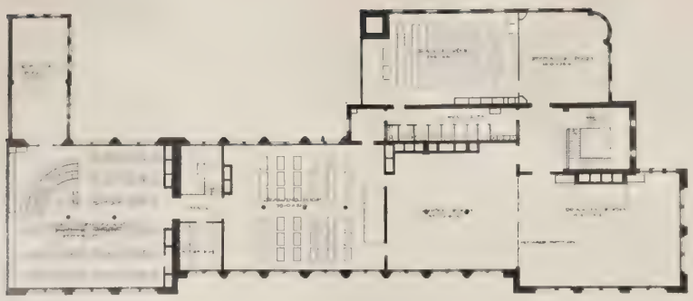
Each pupil is supplied with a tray for carving tools 26½ ins. long, 13¾ ins. wide, and 1¾ ins. deep, divided into compartments. These trays are stored in cases at one end of each room. In each room is a grindstone with trough.

The tool room, which contains a variety of minor supplies, together with a large collection of miscellaneous tools for occasional use, is located between the two wood-working rooms, and is entered from either of them. Many of the shelves in this room are divided by narrow strips of wood in such a way that each tool has its appropriate compartment. Each pupil is supplied with three brass checks bearing his shop number, one of which will be received by the person in charge of the tool room in exchange for any desired tool. The check is placed in the compartment from which the tool is taken, where it remains until it is redeemed by the return of the tool.

Opening out of one of the wood-working rooms is a small room for the preparation of stock for models and for special saw work, in which is installed a double-arbor bench saw, a band saw for the use of the instructors and especially skilful pupils only, and a jig saw which all the pupils are permitted to use. The location of these saws in a separate room permits their use without disturbance to class exercises.

There are thirty-six benches in the wood-turning and pattern-making room. On one side of the bench is an 11 in. speed lathe, the other end is used for hand tool work. As in the other wood-working rooms, these benches are fitted with 9 in. quick-action vises. Beneath the lathe is a tier of three drawers, in each of which is kept a set of turning tools. On the opposite side, under the work bench, is a tier of four drawers. The top drawer in this tier is devoted to the measuring and miscellaneous tools used in common, while each of the three others contains an undivided set of cutting tools.

The forge shop, when constructed in accordance with the plans here shown, will be 40 ft. long, 100 ft. wide. It is to be lighted both by windows in the wall and by a large monitor with skylight. The restriction of the site necessitates a closer relation of the forge shop with other parts of the building than is theoretically desirable, but the experience with the room as originally constructed proves that the noise incident to the work of this shop will be of but little practical disadvantage in spite of the closer connection given by the enlarged shop; at least, this disadvantage is not enough to outweigh the advantage of the equipment of this shop for the



THIRD FLOOR.

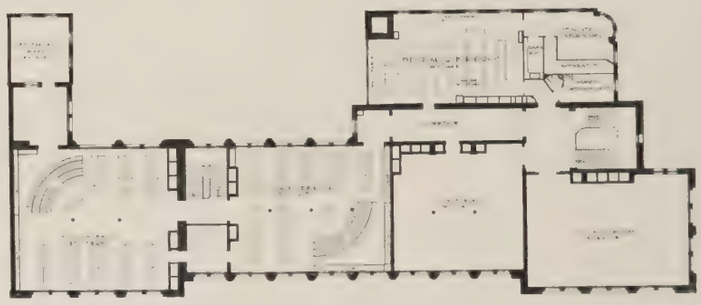
instruction of thirty-six, instead of, as formerly, twenty-four pupils in a class.

The forges, of the Sturtevant single-fire, down-draft pattern of the latest make, are to be ranged on each side of the room, and in a double row. An 130 lb. anvil is to adjoin each forge, and near by is to be a tool bench. Each boy has a drawer in this tool bench for the storage of models and for his hammer.

Eleven blacksmith's vises are attached to benches 21 by 30 ins., 34 ins. high. The blast for the forges is to be given by fans, by which also the foul air and the products of combustion are to be carried off through underground ducts to the aspirating shafts through which runs the boiler flue. The instructor's forge and two other forges are to be supplied with hand blowers for use when the engine is not running. Near the instructor's anvil is to be a 75 lb. power hammer. At the center of the room is to be placed a combination power punch and cutter. Attached to the wall near the power hammer is to be a drill press. At the opposite side of the room, resting on an iron bracket bolted to the wall, is to be a grinding machine, which carries at each end of the spindle a 12 by 1½ in. emery wheel. At the end of the shop, opposite the instructor's forge, will be two cases for the storage of supplies and special tools. The equipment of the room is to be completed by a bolt-heading machine, an oil tank, a brine tank, and a swage block.

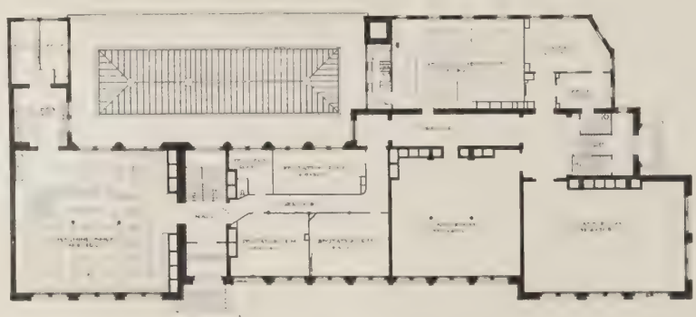
The machine shop is equipped for classes of twenty-four pupils. The benches, 20 ins. wide and from 32 to 36 ins. high, which extend along three sides of this room, are divided into twenty-four sections, each provided with a vise and with a tier of four drawers. One of the three lower drawers is assigned to each pupil, but the top drawer is reserved for the tools used in common by members of different classes. In his individual drawer the boy stores the work upon which he is engaged, together with about a dozen files and a set of chisels and lathe tools. At the beginning of a lesson each pupil obtains from the tool room a tray adapted to fit a compartment either in the upper drawer at his bench or on the tool board of his lathe. This shop is equipped with the following tools: Twenty-four lathes, nine hand lathes, two planers, one pillar shaper, one milling machine, one tool and cutter grinder, two upright drills, two grindstones with troughs, one wet and dry grinder, one arbor press, one power hack saw.

Each engine lathe is furnished with a tool board of special design, adapted to receive the tool tray, and to provide a convenient place for cutting and miscellaneous tools. Upon pegs in a vertical board fastened under the bed of each lathe are kept the face plates, change gears, back rest, chuck drill rest, and a set of dogs. There is no available space for an amphitheater similar to those in the wood-working department. During the demonstration lessons pupils occupy tablet armchairs grouped about the instructor's bench, which is placed in front of a large blackboard in the rear of the room. Near at hand is the tool



SECOND FLOOR.

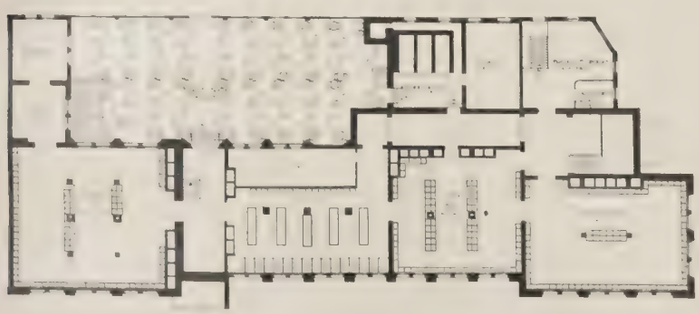
room, furnished with shelves and cases for the numerous tools required for the various kinds of work. One of these cases which stands near the door contains the small tools likely to be needed frequently, and the tool trays previously mentioned. An attendant delivers these trays to the pupils at the beginning of the lesson, and is always ready to furnish any desired tool in exchange for a pupil's check. The universal tool and cutter grinder and the power hack saw are located in this room.



FIRST FLOOR.

It is the opinion of Dr. Parmenter that it is inadvisable to have more than twenty-four pupils in a machine-room class, even when the arrangement of the building is all that is desirable when it is equipped, and with the best appliances, as a larger number cannot receive the requisite individual supervision by the chief instructor; and further, that in none of the other mechanical departments of such a school should there be a greater number than twenty-four in a class unless the arrangement of the building is thoroughly convenient and the equipment is of the best pattern and quality.

The experience in this school also shows that the large class rooms for seventy pupils are undesirable unless supplemented by an ample number of large recitation rooms, each to accommodate thirty-six pupils. The Boston school, if space had permitted, would have been provided with two such recitation rooms in addition to those which are shown on the plans.



BASEMENT.

Suburban Residence Built of Brick.

COST, TEN THOUSAND DOLLARS.

BY CHARLES A. RICH.

THE author of the "Story of My House" remarks that "if we leave the house to the architect, he builds merely for himself — he builds *his* house, not yours." This is just what we propose to do. The client has left the office, and, thank Heaven, has put the ocean between us, and has left nothing behind to remind us of his existence except a brief page of "necessities" and a bright, crisp check for ten thousand dollars. We place it on ice for preservation until the house is completed.



EXTERIOR.

Our client does not have to earn his daily bread; his father was an engraver and etcher of note, and upon taking up his residence among the justified, left to his son not only his own good taste in matters of art, but also sufficient to keep the wolf from the door.

The young man meanwhile gave promise of being sufficiently gifted in black and white to keep himself and the toby closet well stocked with the necessaries of life. Thus our work on his house is cut out for us and made the more easy. Now, since every man has what may be called his own distinct character, so it seems to us that his home should reflect somewhat of this character, at least as to his needs, so that the man will fit into the house, and his desires and modes of life find expression in the general arrangement of parts.

To begin with, we find in the list of "necessaries" that our own hobbies have been met to the letter, and we can practically build to suit ourselves. This is his first house, but it is our one hundredth or more, so we ought to know what he ought to want.

To illustrate our hobbies: I have known a man who would willingly go without the almost necessary apparel of civilized man, and perchance be down at the heel or lacking in buttons, yet he would buy beautiful pictures, or books, or bric-à-brac. Now this man is sensible; he gets all there is enjoyable in life, although some people think his discrimination curious. Just so in our house we shall insist upon an enormous room which we shall call "the living room," even at the expense of all other reception quarters, wainscots, carvings, etc. We shall also insist upon a fireplace in this room of rooms that shall grow sick at any wee billets of wood, and demand the good old-fashioned logwood bonfire. The expense of a few cords of good cheer often wards off dollars' worth of gloom and blues. I remember in old-time fireplaces there were nooks and crannies, cupboards and closets. Not to be beaten by our forefathers, therefore, in matters so important, we simply call attention to the sketch of the fireplace, the facing simply laid up in soft red brick tile, with the inviting little toby closets on each side, and the shelves of which seem to indicate the insidious cocktail and the fragrant Havana. We never see them, they are for our friends, of course.

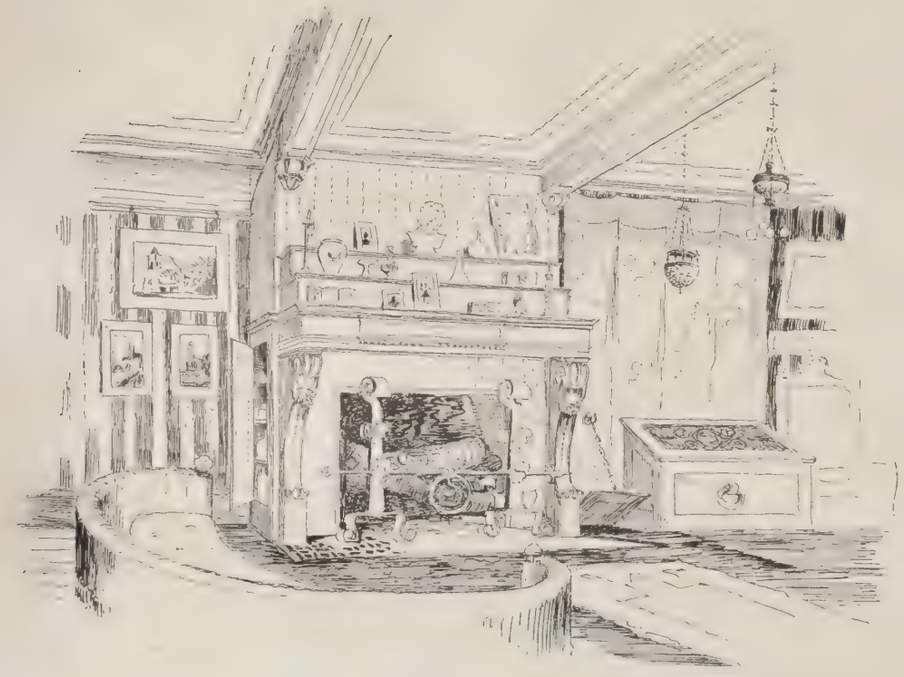


ENTRANCE.

Secondly, every man must have a place of retreat, his den, his workshop, his library, whatever you may choose to call it. He must have a place of retreat where he may lock himself in, or be locked in upon occasion. In this particular case, about the only instruction of our client was to have his den towards the north, so that when the inspiration struck him, he might the better carry on his work. A glimpse of this room may be seen in the plan through a picturesque little balcony in the living room, the floor being raised five steps above the hall level, and the opening being filled with an old iron gate grille, picked up, we will say, in Spain, or some other foreign clime.

Since our check is not large, we cannot reasonably expect a large house, so you will note that the den and kitchen quarters are but one story high. But this gives the possibility of running the den roof on a pitched slant, whose real timbers we have exposed and neatly stained green, and whose roof will not be hot in summer, being towards the north. The sketch will show you the general treatment. Here is an all brick mantel made of soft green-glaze brick, simple in design, but running high up and all exposed.

We insist that with most people beautiful surroundings induce beautiful things. Our client, therefore, as he sits at his work table, shall have before him an old rose arbor, bright with shadows in the morning, and soft and cool in the shade of the afternoon, and if perchance his mind wanders, as he works, to those cooling retreats of a Capri or an Amalfi, he will find a little doorway in the corner of his room through which he may glide into his arbor and revel in the same day dreams of those lovely spots. He, too, if he will, may



LIVING ROOM.

have his *siesta* in a grape or rose shadowed arbor, and if he has been sensible enough in his purchase of a hillside to overlook a water view, his dreams may be sweet indeed.

Our last point of insistence concerns the mother as well as the head of the house. Have you ever lived in a house with a growing family and a single bathroom, bluntly speaking? If you have you have probably too often stood in abbreviated costume, awaiting your opportunity to slide in and enjoy your morning plunge. We trust you did not have to take the 8.20, for if you did, you have often waited in vain, and after words not fit to be printed have given it up. Yes, "godliness with contentment is great gain," but contentment can never be attained with one bathroom, and as for godliness, well, that is out of the question under such trying circumstances. We insist, therefore, on two of these luxuries, and do not forget a third for the servants, an absolute necessity in our mind.

Lastly, we are selfish men! We admit it; and since we are to spend one third of our life in nocturnal repose, we propose to have our sleeping apartments the largest and most comfortable the house affords. We must be awakened in the morning by gladsome sunshine, if we will, and not by the shades of the past night. And this same gladsome sunshine must flood this apartment each hour of the day; for it must be remembered that since the house is of modest proportions, this room is largely the day home of the wife, and her comfort is to be equally looked after. What applies to the man must the more apply to the wife: another reason for its largest size. Adjoining, and full of all-day sunshine, come the quarters of the children. They, also, are equal factors in the home life, and as such must have a slice of the best accommodations possible. And what about the guests? Well, they are transients and must be content with what is left.



·AT·END·OF·PIAZZA·

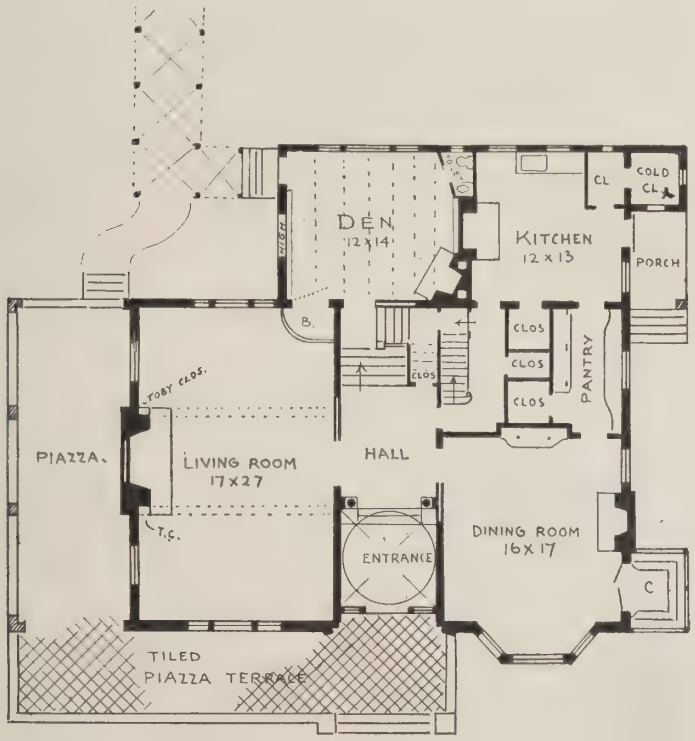


DEN.

While you have been upstairs we have been preparing the entrance. Here we intend to make a departure from the general mode. We came across a beautiful, ivory-colored speckled brick while we were considering the plan, and at once determined to enter the house on a lower level, make a sort of lower vestibule with tiled floor and side walls, and simply groined ceiling of these soft-colored bricks. Why not? Introduce, then, a frieze of the old Parthenian casts, recalling thus to the mind the beauties of the Acropolis, and we surely have an inviting entrance. We also have a place to seat the persistent book agent, the aromatic piano polisher, the messenger boy, or that constantly appearing personage known to every household as the "unknown." Even so, let it be all brick and tile, to intimate that he who stops there is yet among the outside elements, and may not ascend to the hall.

But one cannot think of his home without placing it among its surroundings, which to make up a whole are necessary and essential parts. The

very trees which overhang their branches, the hedges, gardens, and shrubs which lend color and tone to the picture, each one plays its part. Think for a moment of the sunny slopes of an Italian landscape, the broad terraces, and the grape-covered arbors. They are the cheapest accessories of the home, and yet they are the features that give esthetic and artistic character to the whole. They are full of sentiment; the very rustle of the leaves, or their ever-varying shadows are joys which increase as nature showers on them an ever-increasing wealth of foliage. Our ground slopes up gradually from the front, and we will build a low brick wall with old gate posts, and wide and generous steps. Back of this, across the front, shall be a low box hedge garden, such as is dear to every old New



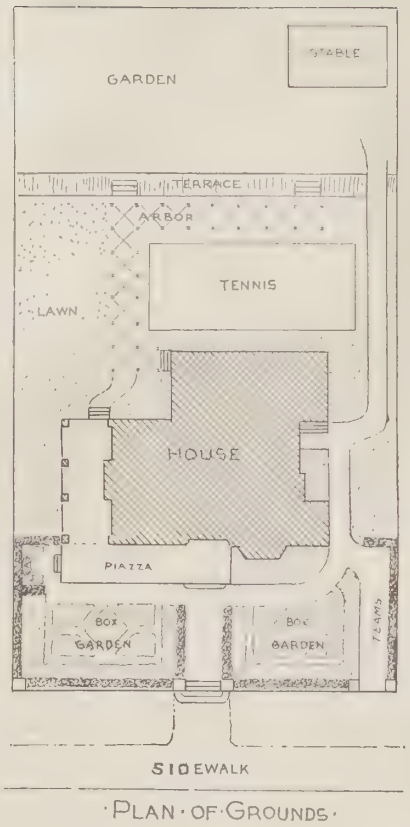
FIRST FLOOR.

England recollection. At the end of the piazza we shall mass the trees, form the hedge with a sort of recess, and therein place a little circular bench, a cool retreat in the morning or after the shadows have fallen in the late afternoon. And then at the rear, as I have already pointed out, we shall form the arbor, and tennis court, and back of this the garden. Do you tell me this seems very beautiful in the word picture, but seldom exists in reality in ten-thousand-dollar houses? Then we shall retort upon you that it is the client's fault and not the architect's. This client is going to have it at any rate, and if you doubt it, you have only to look at the little plan of the grounds.

But what of the outside of our house and its general construction? Louis Stevenson portrays his house in poetry: —

> "Here all is sunny, and when the truant gull
> Skims the green level of the lawn, his wing
> Dispetals roses; here the house is framed
> Of kneaded brick and plumed mountain pine,
> Such clay as artists fashion, and such wood
> As the tree-climbing urchin breaks.
> My house, I say."

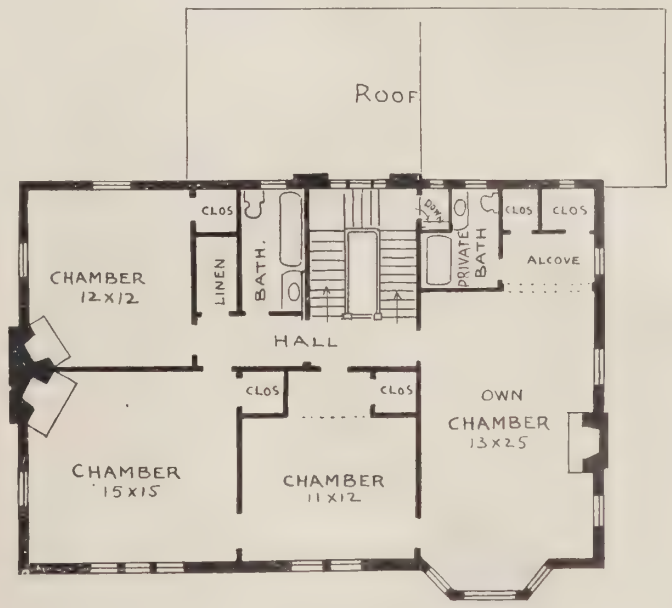
So let it be; good red brick, and its enrichments shall be of terra-cotta of the same character. We shall select a hard-burnt common brick and shall thank our brickman if he will send us all the old black vitreous cast-off odds and ends of his kiln. A curious order to a layman, who will not look at them in the pile, but will wonder at their beautiful effect when laid up with random headers, with white pointing. No feature is so well adapted to our material as the arch, and we shall therefore use it for our entrance and the two large windows in the living room. The quoins shall be simple with deeply molded jambs of brick. In the gables we shall still use brick, but dispose of it between the heavy open beams in diaper patterns. Thus is every component part of our house formed from the clay of which the scripture informs us on good authority we, also, are most wondrously made. Thus, also, is our client and his house bound together by a common tie, and singularly enough, the house will outlast the client.



PLAN OF GROUNDS.

But after all, why describe the exterior further? Candidly, we live in the interior, and the exterior is but the shell, which we have pictured to be of simple form to cover the plan. "I like it — I like it not," and herein is contained the whole matter.

THE discussion on the extension of the Boston fire limits has reached a rather acute stage. It is argued that to build of brick is so much more costly than to build of wood that the owners of land in the less thickly settled wards could not afford to improve their property, but must sell at a loss, and the value of land so restricted would be greatly reduced. This notion seems to have produced a certain effect upon the public, but, like a good many other apprehensions which stand in the way of public improvements, it would be hard to tell on what real foundation it rests. Certainly, the prohibition of wooden buildings in Philadelphia has neither ruined the suburban districts nor deprived the poorer citizens of homes. On the contrary, in no great city on this continent are people of small incomes housed so safely and comfortably as in the little brick houses of the outlying parts of Philadelphia. — *American Architect.*



SECOND FLOOR.

Brick and Marble in the Middle Ages.

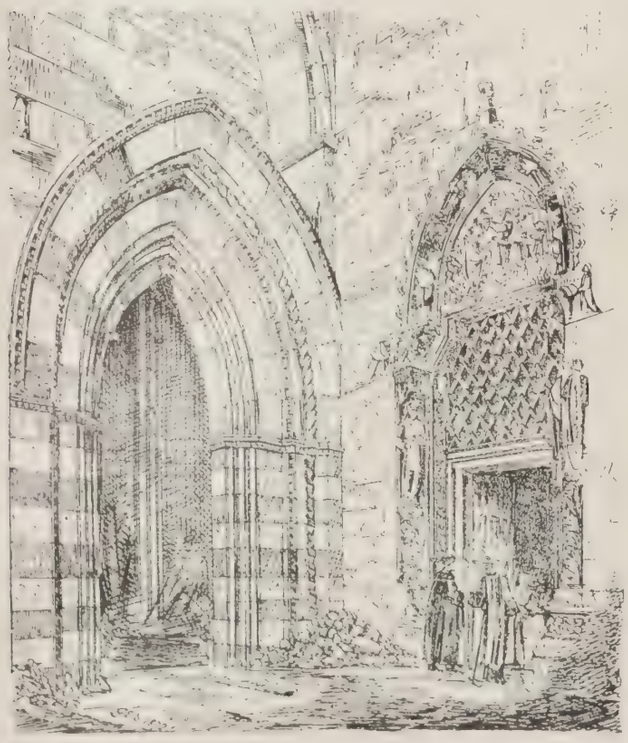
BY G. EDMUND STREET.

CHAPTER IX. (*Concluded.*)

AT Aquileja the appropriation of pagan fragments was carried so far that we found Classic capitals doing service as holy-water stoups.

The interior of the eastern part of the church is more interesting than that of the nave. It is all probably of the original foundation, and retains most of the old arrangements. The floor of the choir is raised some ten or twelve steps, with two flights of steps on each side of the centre. At the top of these steps, projecting sideways into the transepts, are tribunes with open balustrades which seem to have served as ambons. The apse has two rows of seats, with the patriarch's seat raised in the centre, and the altar stands in front of this on the chord of the apse. It is curious that this, which is an apse internally, is a square projection from the transept externally.

A descent on each side under the tribunes leads to the crypt under the raised choir. This is very small, but is divided into three aisles in width, and four bays in length. The central space is screened round jealously with close grilles reaching from floor to vault, so as to protect the shrine of S. Hermacora, which occupies the centre. But little light steals into this crypt, and that little has to find its way between rank weeds which grow up round the windows; but there is quite enough to reveal vaults covered with paintings of subjects, and to show as picturesque and beautiful an *ensemble* as one need wish to see. Kneeling desks were placed round the shrine, but the cultus of S. Hermacora seems to be no longer popular, and the only pilgrims are curious visitors like ourselves.

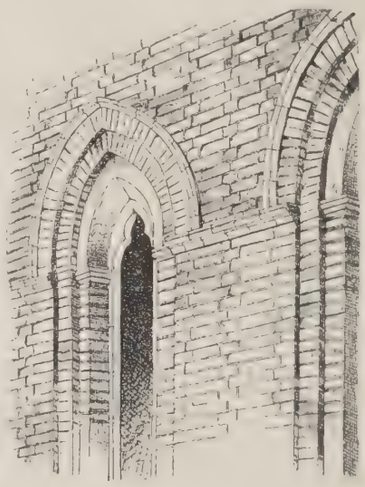


DUOMO, UDINE.

The paintings on the groining appeared to me to be of not earlier date than the fourteenth century, and are very cleverly contrived to suit the early vaults.

The transepts remain to be mentioned. Each has a small eastern apse near the extreme end, and a tomb or shrine between this apse and the choir tribune. These are of the thirteenth century, and are enormous blocks of stone, panelled and carved in front, and supported on four detached shafts. In the south transept there are fragments of a Byzantine screen round the altar in the small apse, which are of rare beauty and intricacy. The screen consisted of a solid base, breast-high, covered with carving, and upon which columns stood originally at intervals of six feet, just as in the screen at Torcello, of which I have given a view.

There is an early painting of Our Lord, seated on a throne in the semi dome of this apse, and there are remains of an early wall-painting in the choir-apse, partly covered by a fifteenth-century picture in a good frame. The choir stalls are of elaborate intarsiatura work, and date from the end of the sixteenth century.



AISLE WINDOWS, DUOMO, UDINE.

A little way to the north of the church stands its campanile, a tall plain mass of masonry, with the date MDXLVIIII. on the upper stage, and the inscription "*Tadeus Luranus hoc o. fecit.*" It is worth the climb to the top to get the view over the flat surrounding country, which reveals what one fails to see from the dead level of the road, that the Adriatic is not far off — far enough, it is true, to have ruined the port of Aquileja — but so near as to be a very important element in the fine prospect. From here we saw through the haze the island of Grado, on which I cast longing eyes in vain. My information as to the distance had been all at fault, and I thought that in a long day from Gorizia, I might see both Aquileja and Grado. This is, however, quite impossible, as the boatmen required, they said, three hours for the *trajet* each way. It was a misfortune to miss the church at Grado, which contains much that is worth seeing, and has considerable historical interest, as the seat of a patriarch, whose jurisdiction included Malamocco, Venice, Torcello, and Chioggia — and whose importance is vouched for by its old titles, "Venetæ oræ Istriæque Ecclesiarum caput et mater," and "Aquileja nova."

The patriarch's throne and the ambon or pulpit, which still remain in the church at Grado, are evidently extremely fine examples of Byzantine furniture. The former corresponds with that of Aquileja, but has the rare addition of a flat canopy or tester supported in front by two columns, which rest on the side walls of the steps leading up to the seat. Probably there was a similar canopy at Aquileja. The dignity of the patriarchal throne is not a little increased by the addition, simple as it is in its decorative features. The pulpit is even more striking; it is six-sided, all the sides being arranged in a series of bold circular projections, with sculptures of the Evangelistic emblems on their face. The pulpit is supported by a central shaft, and six smaller columns alternately plain and spiral, and above the pulpit a series of octagonal shafts are provided to support a canopy or dome over the head of the preacher. These columns carry arches which are of the common Venetian ogee trefoil outline, and, there can be little doubt, are later than the pulpit. The combination is, however, very picturesque, and not the less interesting in that it has a most strangely Eastern look.[1]

The rest of my party went, whilst I was sketching in the cathedral at Aquileja, to look at the baptistery. They reported it to be as completely modernized inside as it certainly is outside, and so I failed to enter it. I believe I lost nothing, though at one time it was well worthy of a visit.

A rapid drive back to Gorizia was made with the advantage of

[1] I take these notes of Grado from "Mittelalterliche Kunstdenkmale des Oesterreichischen Kaiserstaates." Stuttgart, 1858.

a view of the mountains before us all the way; and we arrived in time to avail ourselves of the last train to Udine, which we did not reach until after dark.

I arrived here in entire ignorance of what might be in store for me in the way of my art. I had seen no drawings of any of its buildings, and I suspect that most of my readers are in the same state of ignorance. It was with no little pleasure, therefore, that my earliest stroll in the morning brought me to a Palazzo Publico, which if not exactly magnificent in scale is at least very important, and has the special merit in my eyes of being all Gothic, and almost unaltered on the outside since its erection. It stands in a piazza which some sixteenth or seventeenth century scenic architect has treated with considerable skill. One or two public buildings and a steep hill behind them have been dealt with in such a way as to call to mind such a disposition of buildings as one sees, e. g., on the Capitol at Rome, and no doubt so as to increase very much the apparent importance of this little city. The Palazzo Publico is a building of two stages in height, the lower entirely open with pointed arches resting on columns, and the upper presenting on its principal front a large balconied window, or Ringhiera, in the centre, and smaller windows on each side of it, and at the ends. The cornice and roof are modern, otherwise the whole design is intact, and exactly in the state in which its architect left it. The character of the design is clearly Venetian, and the date about the beginning of the fifteenth century, but still it is not slavishly Venetian as the houses of Vicenza are, but on the face of it the work of a local architect who knew enough of what was being done in Venice to profit by it without absolutely copying.

The lower or ground story is open on three sides, and has ten arches in front, and five at each end. The space inclosed is irregularly divided by a longitudinal line of columns, carrying semicircular arches, which support the walls of the rooms above, the access to which is by a modernized staircase in the rear. The materials of the walls are generally red and white marble. The balustrades between the columns and the staircases leading to them are so good and complete as well to deserve illustration. The upper part of these, including the cusped heads to the openings, is of white marble, whilst the shafts are alternately of the same material and of serpentine. The upper story is modernized within; but one learns to be grateful for small mercies, and it was certainly with every feeling of gratitude to later architects that I sketched this really beautiful building, which they have been good enough to leave so nearly unaltered on the outside.



PALAZZO PUBLICO, UDINE.

The state of the cathedral is less a subject for thankfulness! The whole building has been completely modernized within and without, with the exception of the west front and the tower. The former was the façade to a nave with two aisles on either side, or perhaps with one aisle and chapels beyond. All the roofs are of the same flat pitch, and stepped regularly so as to give a broken and bad outline to the mass. The work is mainly of brick, with some good detail in the windows of the outer aisles, of which I give an illustration. The west doorway is of the fourteenth century, with a very steep crocketed gable between pinnacles, and a badly sculptured tympanum with a curious assortment of subjects; in the centre the Crucifixion, right and left of this the Resurrection and an Agnus Dei, and above it the Nativity. Three circular windows light the three centre divisions of the front, and the two lower are connected by a broad band of brick arches which crosses the entire front just below the central circular window. There is not a word to be said in favour of such a design. It *is* old, and that is its only virtue!

The tower is more interesting, though it is only an incomplete fragment. The lower stage is of stone built in dark and light courses, with a large sunk recess on each side. On the west side is a fine doorway built of alternate courses of white marble and serpentine, and there are small circular windows in the cardinal sides just above the lowest stage. Above these the whole is a plain mass of brickwork, of which a very small portion only seems to be original. This tower is no less than fifty-two feet in outside diameter, and its lowest stage is finely groined, with no provision for the passage of bells. It might almost as well have been intended for a baptistery as for a tower! It stands close to the north side of the choir, and by its side is a rather fine doorway leading into the transept, with a good deal of late Gothic sculpture and architectural detail. There are niches and figures in the jambs and round the arch, the Coronation of the Virgin under the latter, and figures of the Annunciation stuck against the wall on either side in a very haphazard fashion. The strange contrast in style between these two doorways will be seen in the illustration which I give. Here we have, side by side, examples of the most pronounced kind of two national styles of Gothic; the door into the tower being as clearly Italian in its beautiful colour and refined simplicity, as that into the church is German in its cleverness, want of repose, and hard angularity of detail.

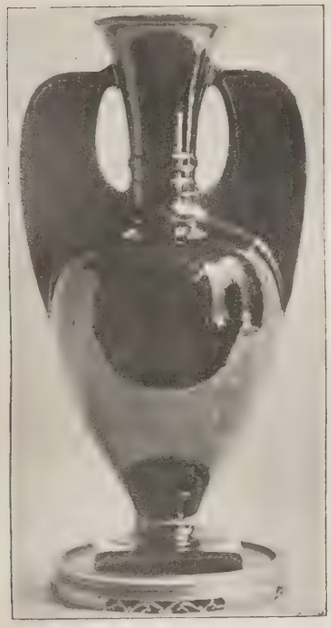
The only other old churches I could find in Udine were San Giacomo and that of the Ospidale. The former is modernized, but retains an early square brick belfry, arcaded below, and with simple pointed windows of two lights above. The church of the Ospidale is also modernized. The façade has a gable with an old brick eaves-arcade, and the only too common feature of a large circular window inclosed within a square border.

A picturesque Renaissance well-canopy (dated 1487) over the Fonte di San Giovanni was the only other feature I could find worth sketching or making a note of; and having seen everything, I took the railway on again to Venice.

The views of the Friulan Alps, under which one travels for some distance, are very exquisite. We passed Conegliano, where I once left the railway for a journey through the heart of the Dolomite country to Cortina d'Ampezzo, and, to my regret, hurried past Pordenone, having forgotten that at any rate a tall brick campanile was there, which seemed to promise some reward to the visitor. It is of plain arcaded brickwork below, and the upper stage is slightly battered out with very tall machicoulis, from within the parapet of which a smaller octagonal stage rises, covered with a low spire. The whole composition as one sees it from the railway is unusual and very good, and recalls just a little the campanile of the Palazzo Publico at Siena.

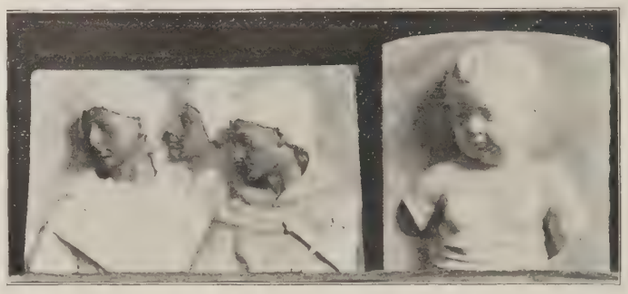
The Grueby Faience.

BY C. H. BLACKALL.



THE opening of Japan to the commerce of the West less than two generations ago brought to what we are pleased to call civilized nations an art development, which, though at that time regarded as barbaric, has since been accepted as a manifestation of the highest appreciative and creative perception. Japanese pottery and faience have set the style for the whole civilized world, and for nearly half a century the aim of our foremost potters has been to produce something which will compare with the Japanese porcelains. It is not for this generation to say how much success has attended our attempts at imitation. We cannot fairly judge of our own achievements as compared with what was produced by a far-off and alien race, but it is certainly given to us to appreciate a pretty full measure of progress which has been ours, and by comparison we can form an estimate of the direction in which the forces of development are tending. As a nation we have been too busy to produce great art works. At any rate we have certainly given more attention to the utilitarian arts than to the purely esthetic developments of human intellect, and until a very recent period it is doubtful if there could have been found in the whole of this country a single manufactory capable of turning out pottery or faience which was worthy for a moment of being compared with the average work of the Japanese, either in design or in the mechanical details of artistic workmanship. It has taken us a long while to approximate the fundamental instincts of the Japanese craftsman, namely, that the art of a piece of pottery is not necessarily dependent upon the amount of work expended upon it, or upon the fineness of the material, but is a direct factor of the thought and appreciative skill possessed by the one whose hand is responsible for the result. That we have learned this lesson to at least a limited extent has been manifested by a recent exhibition in Boston of the work of the Grueby Faience Company. It has been a privilege and a pleasure to watch the attempts which Mr. Grueby and his earnest colleagues have been making for a number of long, weary years to develop the manufacture of artistic faience, a manifestation of industrial art which has until recently obtained but scant recognition, but which is bound to take an important rank; and it is a pleasure to record the persistent struggles which the Grueby Company have maintained to produce something which was perhaps a little beyond the average market, but which was certainly in a direction which the country is rapidly growing to, and which appeals most strongly to the artist. It is this kind of imaginative work which is deserving of the utmost encouragement. It is by efforts such as have been made by this concern that our artistic manufactures are going to rise, and surely no one who is familiar with the best of the Japanese work could have visited this exhibition without being impressed with the extent to which these craftsmen have been able to give to their work the elements of sincerity, of perfect fitness, and of thoroughly artistic good taste, quite irrespective of mere fashion, which go so far towards forming the fundamental worth of the Japanese product. The Grueby faience and pottery





is not Japanese, except in that the spirit is common to Japanese work. The motives in this work are in many cases frankly borrowed. Life is too short and the nineteenth century is too well educated to feel any necessity for arbitrarily inventing all details, but borrowing, as these artists have, from the past, from Italy, Spain, or Japan, is merely bringing to us a little measure of the art which has graced our more fortunate neighbors, and showing us how problems can be solved here quite as successfully as there.

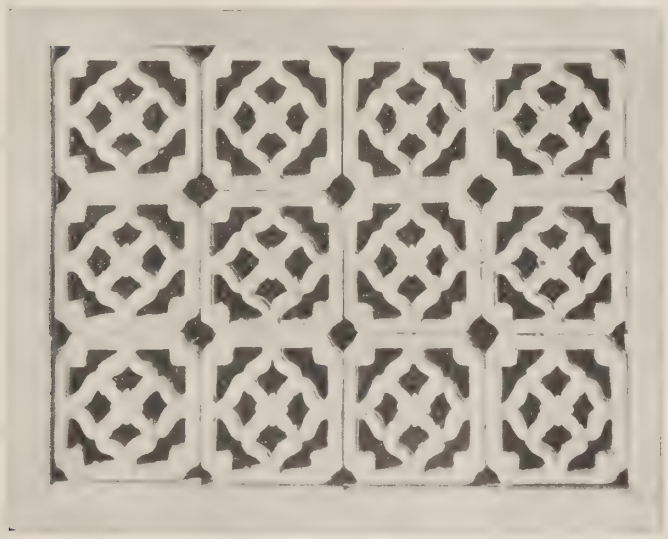
Some of the purely architectural faience work of this company is not unfamiliar to the readers of this publication, having been well known for a number of years. The exhibit included some excellent high relief work in the style of the Della Robbias, with the same treatment of enamels and strong glazes which characterizes the work at Pistoja. The value of such work is in its careful modeling and judicious coloring. Technically it is quite as satisfactory as the older work. There has been as yet but little opportunity to see such work in place to any great extent, but there is surely no mechanical or artistic reason why, if the need arose, it could not be quite as satisfactorily met in this medium. Another application of faience which was illustrated in the exhibition was in the form of balustrades for terraces, conservatories, etc. The work shown by the illustration is a dull blue, and was a portion of a railing used in a house at Cambridge. There are possibilities in openwork filling of this description which are very entertaining, carried out either in full glazes or in the dull mat finish, which Mr. Grueby has been able to apply very successfully to a number of the architectural forms. There was exhibited also a large lion's head,



very boldly modeled and enameled a dull copper bronze, with a mat surface, having all the effect of wrought bronze.

In tiling there were a number of interesting pieces. The illus-

tration shows one of the Moorish patterns. The main lines of the design are in low relief, the pattern being brought out by the enamel-



ing settling into the hollows. The upper border shows a buff key pattern on a pale green ground, with an edging of strong blue. The palm pattern below it is a deep blue glaze ground, with a mat, dull green pattern. The coloring of the tiles themselves can only be approximately appreciated from the photograph. The strong squares of colors at the corners are in a deep indigo blue. The center of each pattern is a pale blue, the radiating figures are green, and the groundwork is a cream with the intersecting patterns forming the outer row of each tile in yellow. The yellow is a bright glaze, and all the rest is dulled to a mat finish. The glaze over the lines of the pattern is very thin, so that the tile body, a pale gray, shows through, with the dull effect of mortar joints. This tiling is a very close imitation of the coloring and of the effect of the old Moorish tiles.



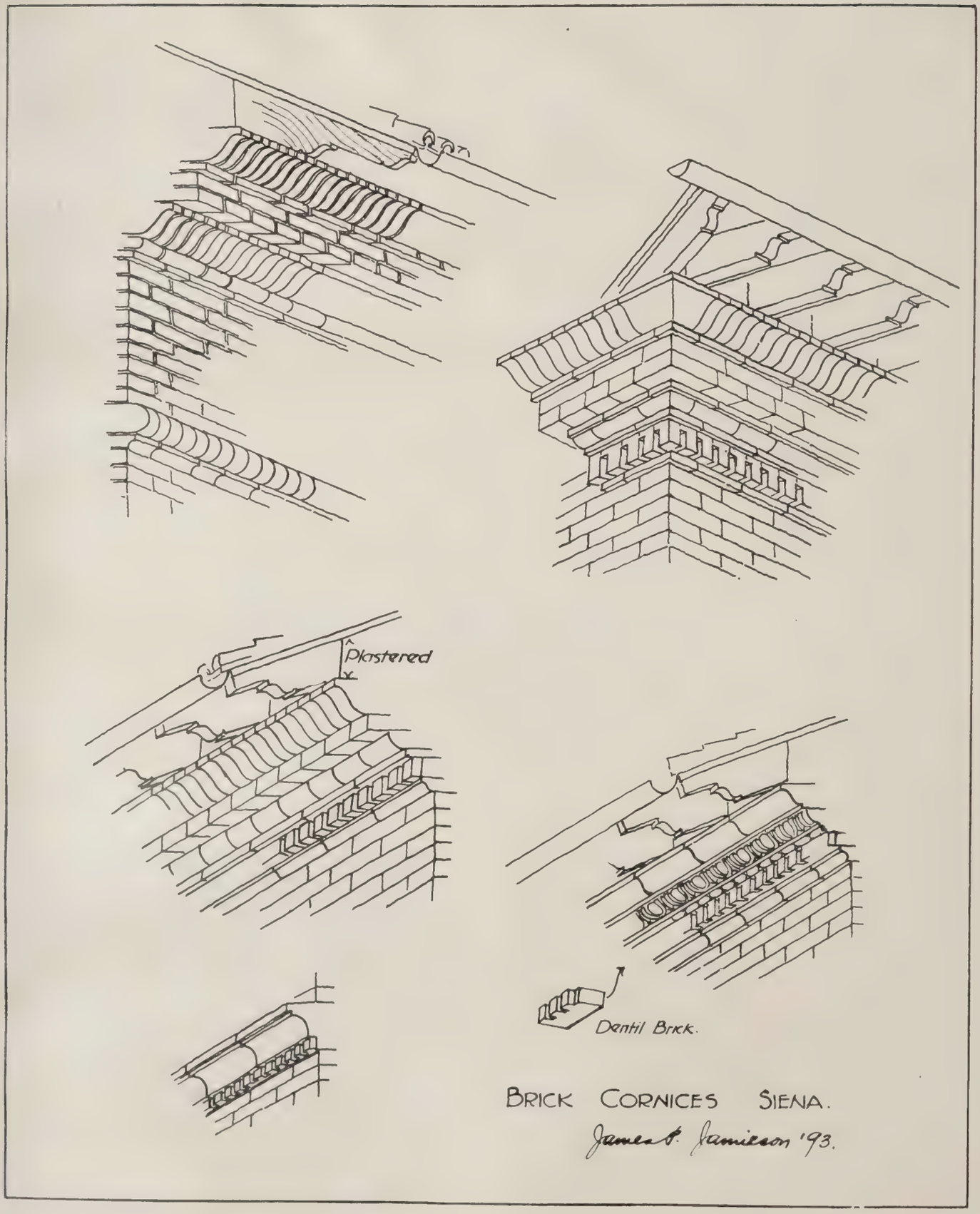
There were also shown a number of exceedingly interesting hand-painted hexagonal tiles with a mottled blue ground, with figures and patterns in slight relief, showing exactly the quality of old majolica ware. There were also some nursery tiles, so to speak, blue patterns and white ground, the ground, however, not a clear white, but a sort of gray crackled effect. These were very interesting and extremely effective. And there was exhibited a part of a set of peacock tiles designed for a fireplace in Cambridge, and a number of heraldic and pattern-work tiles in which the outline of the figure was formed with slip and the colors put on under the glaze. In all of this tiling work there is an entire absence of the machine effect which makes a great deal of our modern tile work so monotonous, and there is a fresh sketchy treatment of the designs which entirely removes them from the commonplace.

The exhibition included several large panels, which had been painted over glaze, by Mrs. Eliza M. Fairchild, for a frieze in the Dutch Room in the Hotel Reynolds, Boston. These were in Delft blue on a white ground, and in a decorative way were quite interesting, though, to our mind, not possessing the intrinsic charm of some of the nursery tiles.

The pottery that was exhibited was in many respects unique. All of this was hand made, thrown up on the wheel with a keen sense of proportion and subtlety of line which can best be described as throughly Japanese, while the variety of shapes, the different contours, indicated a most fertile, directing mind. They included jardinieres, flower-stands, incinerary urns, and other shapes, useful and ornamental. The illustrations show only a few of the forms, and utterly fail to give the exquisite color effects. There was a lot of ware made with a grayish body with dull crackled effect running all through it under the glaze, something in the style of the old Satsuma ware, the glaze being kept down to a very dull mat surface. These were especially artistic both in outline and in effect of color. One jar, which is remembered with especial delight, was a tall shape, standing eighteen or twenty inches high, with a ground of pale dappled green shot through with threads of white, filmy crystals under the glaze, giving the effect of a bit of old Genoa damask; a kind of jar which would make the collector's heart warm to the very cockles, and would be a thing to put upon the corner of a mantelpiece and worship devotedly every morning — one of those bits of individuality which are only possible when an artist is willing to linger lovingly over the decorating of a piece of earth, and to experiment, and try and hunt out new artistic possible combinations of chance and thought. Then there were a number of shapes in a mottled silvery yellow, which were peculiarly effective; and there were several large jars in pale greens and warm browns, with mottled wave lines running around the surface, and quaint handles on each side; jars that had no purpose but their beauty, and fully and completely answered that purpose. In fact, the exhibition offered a strong contrast between the purely esthetic jugs and pots which had no excuse but their beauty, no aim but to give pleasure, no thought but to delight the esthetic appreciation, and the very practical tiling, the wall linings of majolica ware, which were primarily for use, fundamentally for service, but were at the same time not without their full share of the artistic sympathetic treatment. There is no need to dwell upon the technical difficulties which Mr. Grueby met and overcame. In an artistic sense these do not concern us, for art is not measured by technicalities, but when we look back ten years and appreciate how utterly impossible it would have been to collect together any such work as was shown in this exhibition, and when we realize how closely this work is in touch with the best spirit of the old Japanese ware which lines the walls of our Art Museum, we can appreciate that though we may not yet have reached the height of the Japanese potter, we at any



rate have been able, in this busy country, to give the time and thought and artistic ability necessary to produce in enameled terra-cottas and in simple potter's clay, works of very high artistic value.



BRICK CORNICES SIENA.

James P. Jamieson '93.

Tensile Tests of Cement.

BY IRA O. BAKER, PROFESSOR OF CIVIL ENGINEERING, UNIVERSITY OF ILLINOIS.

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OF all the structural materials probably hydraulic cement is the most variable in its qualities; some varieties are strong and some weak; some are slow setting and some quick; some are durable and grow stronger with age, while some are liable to deteriorate in strength, and perhaps become an agent of destruction. Partly owing to the variability in the product and partly because of the greatly increased use of cement in architectural and engineering construction, rapidly increasing attention is being given to the testing of cement.

There is no lack of literature on this subject, which contains much valuable information, and yet the writer believes that much of the astonishing variation in the results obtained by different operators is due to a difference in methods. Unfortunately, there is no detailed and uniform method of procedure in use in this country; and it is usually impossible to determine from the report of the results what method was employed in making the tests. The writer will, therefore, attempt to make an unusually full and complete statement of the method of making the tests, and call attention to such variations in practise as are in common use.

In this article attention will be given to tests of tensile strength, partly because of the importance of such tests and partly since a description of the method of making these tests is a preliminary to the consideration of the other tests necessary to fully determine the quality and durability of a cement.

The tensile strength of cement mortar is usually determined by submitting a specimen of 1 sq. in. cross section to a tensile stress. The reason for adopting tensile instead of compressive tests is the greater ease of making the former, and the less variation in the results. Mortar is eight to ten times as strong in compression as in tension.

The accurate determination of the tensile strength of cement is a much less simple process than at first appears. Many things, apparently of minor importance, exert such a marked influence upon the results that it is only by the greatest care that trustworthy tests can be made. The variations in the results of different experienced operators working by the same method and upon the same material are frequently very large. The variation is chiefly due to the fact that there is no detailed and specific description of the method to be pursued in preparing and testing the specimens.

NEAT *vs.* SAND TESTS.

It is very common to test neat cement mortar. There are two serious objections to this practise. First, most neat cements decrease in tensile strength after a time. This decrease seems to be due to a change in the molecular structure of the cement, the crystals growing larger with increase of age, thus producing a crowding which results in a decrease of the tensile strength. This decrease is most marked with high-grade Portlands which attain their strength rapidly, and usually occurs between three months and a year. A second objection to neat tests is that coarsely ground cements show greater strength than finely ground cements, although the latter when mixed with the usual proportion of sand will give the greater strength.

On the other hand, more skill is required to secure uniform results with sand than with neat cement.

THE SAND.

The quality of the sand employed is of great importance, for sands looking alike and sifted through the same sieve give results varying 30 to 40 per cent.

The standard sand employed in the official German tests is a natural quartz sand obtained at Freienwalde, on the Oder, passing a sieve of 60 meshes per square centimeter (20 per linear inch) and caught upon a sieve of 120 meshes per square centimeter (28 per linear inch). The diameters of the wires of the sieves are 0.38 and 0.32 millimeters respectively. The standard sand recommended by the Committee of the American Society of Civil Engineers is crushed quartz used in the manufacture of sandpaper, which passes a No. 20 sieve (wire No. 28 Stubs's gage), and is caught on a No. 30 sieve (wire No. 30 Stubs's gage).

The crushed quartz consists of sharp, glossy splinters, while the standard German sand is composed of nearly spherical grains having a rough surface like ground glass. The quartz contains about 50 per cent. of voids, while the German standard sand contains but about 40. Crushed quartz gives less strength than standard sand and ordinarily common building sand will give a higher strength than standard sand, since usually it consists of grains of a greater variety of sizes, and consequently there are fewer voids to be filled by the cement.

THE AMOUNT OF WATER.

The amount of water necessary to make the strongest cement varies with each cement. It is commonly expressed in per cents. by weight, although in part, at least, it depends upon volume. The variation in the amount of water required depends upon the degree of fineness, the specific gravity, the weight per unit of volume, and the chemical composition of the cement. If the cement is coarsely ground, the voids are less, and consequently the volume of water required is less. If the specific gravity of one cement is greater than that of another, equal volumes of cement will require different volumes of water. The chemical composition has the greatest influence upon the amount of water necessary. Part of the water is required to combine chemically with the cement, and part acts physically in reducing the cement to a plastic mass; and the proportion required for each of these effects differs with different cements. The nature and condition of the sand may also appreciably affect the quantity of water required. The finer the sand, the greater the amount of water required. Again, the more thorough the mixing, the less the quantity of water required.

Attempts have been made to establish a standard consistency, but there is no constant relation between the consistency and the maximum strength. With one cement a particular consistency may give maximum strength, while with another cement a different consistency may be required to develop the greatest strength. The relationship between consistency and strength will vary also with the details of the experiment. In reporting the results of tests the quantity of water employed should be stated.

There are two distinct standards of consistency for the mortar employed in testing cements, — the plastic and the dry.

Plastic Mortar. This grade of mortar is that commonly employed in the United States and England, and is frequently used in France. There are two methods of identifying this degree of consistency, viz.: the Tetmajer method and the Boulogne method.

The Tetmajer method is much used on the continent of Europe. It is as follows: "The plasticity shall be such that a rod 0.4 of an inch in diameter, and weighing 0.66 lbs. will penetrate 1.25 ins. into a box 3 ins. in diameter and 1.57 deep, filled with the mortar."

The Boulogne method is much used in France, and gives substantially the same results as the Tetmajer method. It is as follows: "The quantity of water is ascertained by a preliminary experiment. It is recommended to commence with a rather smaller quantity of water than may be ultimately required, and then to make fresh mixings with a slight additional quantity of water. The mortar is to be vigorously worked for five minutes with a trowel on a marble slab to bring it to the required consistency, after which the four following tests are to be applied to determine whether the proportion of water is correct: —

"1. The consistency of the mortar should not change if it be gaged for an additional period of three minutes after the initial five minutes.

"2. A small quantity of the mortar dropped from the trowel upon the marble slab from a height of about 0.50 meters (20 ins.) should leave the trowel clean, and retain its form approximately without cracking.

"3. A small quantity of the mortar worked gently in the hands should be easily molded into a ball, on the surface of which water should appear. When this ball is dropped from a height of 0.50 meters (20 ins.), it should retain a rounded shape without cracking.

"4. If a slightly smaller quantity of water be used, the mortar should be crumbly, and crack when dropped upon the slab. On the other hand, the addition of a further quantity of water — 1 to 2 per cent. of the weight of the cement — would soften the mortar, rendering it more sticky, and preventing it from retaining its form when allowed to fall upon the slab."

With any particular cement the exact amount of water to produce the above degree of plasticity can be determined only by trial, but, as a rule, the quantity required will be about as follows: —

For neat cement: Portland, 23 to 25 per cent; natural, from 28 to 36, usually from 30 to 32 per cent.

For 1 part cement to 1 part sand: Portland cement, 13 to 15 per cent. of the total weight of cement and sand; natural, 17 to 20, usually 18 to 19 per cent.

For 1 part cement to 2 parts sand: Portland, 12 to 13 per cent. of the total weight of the sand and cement; natural, 12 to 16, usually 13 to 15 per cent.

For 1 part cement to 3 parts sand: Portland, 11 to 12 per cent. of the total weight of the sand and cement; natural, 12 to 13 per cent.

Dry Mortar. This grade of mortar is employed in the German and French governmental tests of tensile strength. The rules for the identification of this degree of consistency are not very specific. "Dry mortars" are usually described as being "as damp as moist earth."

The German government does not recognize tensile tests of neat cement mortar, but for 1 to 3 sand mortars specifies that the weight of water used for Portland cement shall be equal to 10 per cent. of the total weight of the sand and cement.

The French Commission gives a rule for 1 to 2, 1 to 3, and 1 to 5 mortars, with either Portland or natural cement, which is equivalent to the formula: —

$$w = \tfrac{2}{3} W R + 45,$$

in which w = the weight, in grams, of water required for 1,000 grams of the sand and cement:

W = the weight, in grams, of water required to reduce 1,000 grams of neat cement to plastic mortar;

R = the ratio of the weight of the cement to the weight of the sand and cement.

For a 1 to 3 mortar the preceding formula gives 8.5 per cent., which seems to show that the French standard requires less water than the German.

The cement laboratory of the city of Philadelphia employs the above formula, but uses 60 for the constant instead of 45. For a 1 to 3 mortar, the Philadelphia formula gives 10 per cent., which agrees with the German standard.

MIXING THE MORTAR.

The sand and cement should be thoroughly mixed dry, and the water required to reduce the mass to a proper consistency should be added all at once. The mixing should be prompt and thorough. The mass should not be simply turned, but the mortar should be rubbed against the top of the slate or glass mixing table with a trowel, or in a mortar with a pestle. Insufficient working greatly decreases the strength of the mortar — frequently one half. The inexperienced operator is very liable to use too much water and too little labor. With a slow-setting cement, a kilogram of the dry materials should be strongly and rapidly rubbed for not less than five minutes, when the consistency should be such that it will not be changed by an additional mixing for three minutes.

Usually the mortar is mixed with a trowel on a stone slab; but when many batches are required there is a decided advantage in mixing the mortar with a hoe in a short V-shaped trough on the floor. Various machines have been devised with which to mix the mortar. The jig mixer is an apparatus in which the materials are placed in a covered cup, and shaken rapidly up and down. The Faija mixer consists of a cylindrical pan in which a mixer formed of four blades revolves. The latter seems to give the better result, but neither are used to any considerable extent.

THE FORM OF BRIQUETTE.

The briquette recommended by the Committee of the American Society of Civil Engineers, Fig. 1, is the form ordinarily used in this country and in England. The form generally employed in continental Europe is somewhat similar to the above except that the section is 5 square centimeters (0.8 sq. in.), and the reduction to produce the minimum section is by very much more abrupt curves.

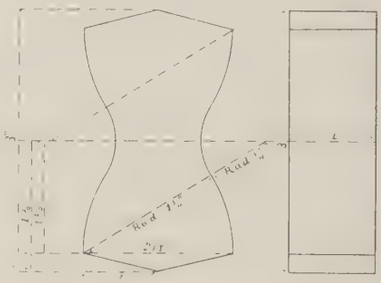


FIG. 1. AMERICAN FORM OF BRIQUETTE.

The molds are made of brass and are single or multiple, the latter being preferred where a great number of briquettes is required. The molds are in two parts to facilitate removal from the briquette without breaking it.

MOLDING THE BRIQUETTE.

In molding the briquette there are two general methods employed, corresponding to the two standard consistencies of the mortar.

Plastic Mortar. As a rule, plastic mortar is molded by hand.

The Committee of the American Society of Civil Engineers' recommendations are as follows: "The molds while being charged should be laid directly on glass, slate, or some non-absorbing material. The mortar should be firmly pressed into the molds with a trowel, without ramming, and struck off level. The molding must be completed before incipient setting begins. As soon as the briquettes are hard enough to bear it, they should be taken from the molds and kept covered with a damp cloth until they are immersed."

The French Commission recommends the following method: "The molds are placed upon a plate of marble or polished metal which has been well cleaned and rubbed with an oily cloth. Six molds are filled from each gaging if the cement be slow setting, and four if it be quick setting. Sufficient material is at once placed in each mold to more than fill it. The mortar is pressed into the mold with the fingers so as to leave no voids, and the side of the mold tapped several times with the trowel to assist in disengaging the bubbles of air. The excess of mortar is then removed by sliding a knife blade over the top of the mold so as to produce no compression upon the mortar. The briquettes are removed from the mold when sufficiently firm, and are allowed to remain for twenty-four hours upon the plate in a moist atmosphere, protected from currents of air or the direct rays of the sun, and at a nearly constant temperature of 15 to 18 degs. C. (59 to 64 degs. Fahr.)."

Various machines have been devised for molding briquettes of plastic mortar, but none are used to any considerable extent. In Canada, and to some extent in England, the briquettes are molded by applying a pressure of 20 lbs. per square inch on the surface of the briquette. Some advocate a pressure of 1,000 to 1,500 lbs. upon the upper face of the briquette.

(*Continued.*)

Fire-proofing.

A CONSENSUS OF OPINION AMONG LEADING ARCHITECTS OF CHICAGO ON THE USE OF BURNED CLAY FOR FIRE-PROOF BUILDINGS.

AS a natural sequence to articles on the use of burned clay as a fire-resisting material by two of the architects of Chicago, THE BRICKBUILDER has sought by a series of interviews, to bring out a consensus of opinion among some of the other leading architects of that city who have had large experience in the erection of fire-proof buildings in which the latest and most improved methods have been used. These interviews demonstrate mainly the esteem in which clay is held as a building material with reference to diminishing losses by fire. There is unanimity among the interviewed in that they prefer burnt clay in some form for all fire-resisting work, and they have demonstrated this in their practise. There is not unanimity, however, in the special kind of clay manufactures preferred, while some have omitted to give their opinions on this interesting question. Hard hollow tile and porous hollow tile still have their advocates, while the virtues of semi-porous tile, that have been advocated in THE BRICKBUILDER, seem to have hardly attracted attention. But there is unanimity in the answers to the question, "Have the recent attacks on the burned-clay systems of fire-proofing, by promoters of other systems, influenced your judgment?" And the answers give no comfort to these promoters. There is more in these than most readers will apprehend, for while these attacks have appeared in publications, often over the names of civil engineers engaged for the purpose, those of which architects are most cognizant are such as they hear in their own offices from the advocates of these very devices and materials. While it is admitted by several that the only reasons why they had in certain cases consented to the use of other materials and methods was the saving of money, which their clients had insisted upon, one of the firms interviewed, which had never used anything but burned clay, made an outside statement that they had in one case tested these claims that the concrete systems were cheaper, by letting all who had asked the privilege submit proposals, all of which, whenever the ceiling and floor construction were both included, proved to be more expensive than flat hollow-tile arches forming both ceiling and floor construction.

These interviews have developed the fact, in Chicago at least, that there is a variance of opinion as to whether or not the makers of and contractors for the construction of burned-clay fire-proofing (all the makers in Chicago contract to set up their work complete) are endeavoring to improve and perfect their material and its method of application. It is fair to assume from this that some, at least, are trying to do so, and these must have been in mind with those who answered affirmatively.

As to the lessons to be found in recent fires in buildings of the modern sort designed to be fire-resisting, we regret to say that the answers do not show such an interest in the subject as some might be led to expect. The answers are mostly in general terms. Some are satisfied with the results, and others say that the work ought to be and can be better, but in what respect they say not.

Architects always want the best of everything if their clients can be induced to pay for it. But they do not often get it if the material is to be covered up when the building is finished. The *Pons Asinorum* that they too often have to cross — and frequently fail in the attempt — is the demonstration to a client who has the figures before him that two bids under the same specification represent two different things, and that the lowest is the most expensive. This is oftener the case with burned-clay fire-proofing material than any other, for there are no two clays alike, and no two makers produce the same article. It is no wonder, therefore, that it was difficult to get direct answers to the seventh question.

It was assumed in the eighth question that the price and quality of burned-clay fire-proofing had been reduced during the last ten years. That the price has been lowered is self-evident, and the reason for it generally given is in the one word "competition." It is also a matter of fact that the quality has *not* been reduced, but has remained stationary. It is a mistaken assumption, however, that improvement in manufacturing processes has reduced the price. To competition alone can this be ascribed, a competition which has offered every possible temptation to reduce the quality. But it has thus far only resulted in reducing weight, and discouraged all attempts to improve methods of construction.

Opinions differ as to the employment of special experts. Those who do not consider it desirable have large establishments of their own and scientific *attachés* regularly in their employ, while the views expressed by Mr. Beman seem to reflect the opinion of the average practitioner.

The following questions were submitted to those whose names appear hereafter, which have elicited very prompt and satisfactory responses.

1. Do you employ burned clay in fire-proof buildings, and if so to what extent?

2. Do you prefer it to other so-called fire-proofing systems, and if so for what reasons?

3. What kind of burned-clay material do you prefer? or would you employ different kinds for different purposes?

4. Have the recent attacks on the burned-clay systems of fire-proofing by promoters of other systems influenced your judgment?

5. Do you think that the makers of burned-clay fire-proofing are trying to improve and perfect their material and its method of application?

6. What do you think is the lesson to be learned from recent fires in buildings fire-proofed with burned clay?

7. Do you think it right for architects to consent to their clients always taking the lowest bid for this kind of work without regard to the differences in what the parties intend to furnish?

8. What do you think is the reason why the price and quality of burned-clay fire-proofing have been reduced during the last ten years?

9. Do you agree with the opinions given by Mr. Jenney in the July BRICKBUILDER?

10. Do you think it desirable for architects to employ fire-proofing experts to design the details of fire-proof work and supervise its erection, as is now done in the case of steel constructions?

Holabird & Roche, whose experience in the erection of the largest fire-proof buildings, in Chicago at least, has been fully equal to that of any other architectural office, submitted their answers in writing as follows: —

"We beg to submit categorical answers to your inquiries regarding fire-proofing" (as follows): —

Question 1. "Yes, for floors, partitions, and protection of all metal work.

Question 2. "Yes, we think it more fire-proof if properly plastered.

Question 3. "Porous terra-cotta.

Question 4. "No.

Question 5. "Yes.

Question 6. "We should have perfect covering of each piece of metal and more substantial fastening or anchoring and the best quality of plaster. No work to be unplastered.

Question 7. "No.

Question 8. "Improved methods of manufacture and general reduction of prices throughout the country caused by panic and competition.

Question 9. "Do not wish to give an opinion.

Question 10. "We have been in the habit of making our own drawings and details."

Daniel H. Burnham, speaking for D. H. Burnham & Co., who are too well known to need introduction, said in answer to the first question: "We use burned clay in all fire-proof buildings; for walls, both outside and inside, and for partitions. We also use large quantities of terra-cotta, enameled and unenameled, for exterior and interior construction and ornamentation. We use hollow-tile arches for all floors and hollow-tile protection for columns, beams, and girders."

In answer to the second question he said: "Yes; because by its use we have a fire-proofing of the best quality and get the best results both in bracing and tying the structure together."

To the third question he said: "For exteriors we prefer brick walls, or heavy brick covering when metal columns actually carry the structure, because they are less likely to be injured by heavy cold water streams in case of fire. We prefer hollow-tile arches between beams because they brace the structure, protect the metal best, and can, with their air chambers, be put in with the greatest rapidity and with a minimum use of moisture, and also because they leave a strong, firm, flat ceiling, against which partitions can be braced effectually.

To question four he said "No," and to five, "Yes." He thought that the lesson to be learned from recent fires in buildings fire-proofed with burned clay is, that the modern methods protect the steel structure against fire thoroughly when they are properly applied. He declined to give an opinion on question seven.

To question eight he said: "I know nothing about the reduction in quality, because we use the best. I think mechanical processes have reduced the price during the last few years." He had not read Mr. Jenney's article, and therefore could give no opinion about it, but with regard to question ten he said: "Speaking for ourselves, we have our own corps of constructive engineers in this office, and these questions are examined and settled by them."

S. S. Beman said: "I have used burned clay of different kinds in all but one of my fire-proof buildings. I used concrete with metallic reinforcement on the tension system only in the last Studebacker Building on Wabash Avenue, Chicago. I had great trouble through delay on account of using the concrete system in winter in this building. A great deal of the work was frozen and had to be done over again. It is an undesirable system to use at such a time. Clay tile can be well set in any kind of weather. When using tile I think the most important thing is to set it right, with good joints, making every joint air tight. I prefer porous terra-cotta, if made of the proper kind of clay, wherever it is possible to use it. I have never used semi-porous hollow tiles. There is very little porous material that is properly made. It requires a plastic fire-clay, which is found in very few localities, and manufacturers should improve their output by using such clays; but most of it that we get is soft and rotten because the makers use local clays to save cost. That now made in large quantities at Chicago has been improved considerably during recent years. Many factories have failed through trying to make it of unfit material. There was once a factory at St. Paul which I understand made such inferior material that its capital was sunk because so much of its output was wasted and rejected. It was only when its failure was assured that it commenced to use the Chaska clay, which made the finest porous terra-cotta I have ever seen. Others took up the manufacture in that city, but I understand they continued to use the inferior clays. The first and best porous terra-cotta ever made in this country was manufactured in Chicago from the clay that comes out of the coal mines at Brazil, Ind., but no one is making porous material from it now. It is only used to mix with inferior clays."

In answer to question four, Mr. Beman said "No." In answer to question five he said: "I hardly think they are." As to question six, he had not studied in detail the published accounts of the results of recent severe fires in fire-proof buildings at Pittsburgh, or formed an opinion as to what should be done to improve fire-proof building materials of clay otherwise than as above stated. He had not tried to get anything better than the market for such things provided; in fact, he had only used such manufactures as he found them always trying to secure, the best.

In answer to question seven, he said: "No, I always dissuade them from it." He thought that competition among manufacturers has been the main factor in reducing the price and quality of the product where the same has been reduced.

As to why a great many architects have not taken an interest in having the fire-proofing systems improved, he said that men who were largely interested in the artistic side of their profession were inclined to be indifferent to such things, while his observation led him to believe that only a few architects who were not so much interested in fine art matters had made a study of the art of fire-proofing applied to construction. In such a state of affairs it was not to be expected that much improvement would result. These were the plain facts. In fact, architects generally who are very busy had little time to do missionary work however much they might desire to do so. If they did, it would often be at the expense of other matters of equal importance. He thought, however, that there should be a consensus of opinion among architects who were designing fire-proof structures; that they should decide between them what is best, stand together and decide to demand it. But he believed this ideal state would never be realized.

Mr. Beman is a believer in having all fire-proof material thoroughly secured in place, though he has no special system to suggest. In his own practise, he has insisted upon the use of copper wires for tying the work together wherever possible to use it, and holding it from the inside, so that all holdfasts will be protected. He has had fires in several buildings he has designed, and there have been no failures in the fire-proof material used. He dislikes the weight of hard tile, which, in case some of it is dislodged, might disturb others in its fall. In other respects he agrees with the opinions expressed by Mr. Jenney. In reply to the tenth question he said in conclusion: —

"I think there ought to be an opening for a specialist in fire-proofing. It is quite as important as any other special branch of the craft, such as steel work, sanitary conditions, etc., where fire-proof buildings are concerned."

(*Continued.*)

THE report of fire losses for 1897 will be of interest to the progressive architect who has made a study of fire-proof structures. The very material reduction in fire losses can scarcely be considered the result of accident. By observing the report (see page 154, THE BRICKBUILDER) it will be seen that the drop in losses is not simply a sudden drop in 1897, but a gradual diminution, 1897 being less than 1896, and 1896 than 1895, and smaller than any year since 1890. This result must be highly satisfactory to both architects and manufacturers of fire-proof materials. And the progressive character of this diminution in losses augurs some influential cause, and this certainly must be found in the increase of fire-proof and slow-burning structures during the last few years. Up to within a short time underwriters have not been willing to give much credit to fire-proofing as a fire preventative or saving feature, but some of the late fires in this class of buildings, especially the Pittsburgh fire, have compelled them to acknowledge the sturdy character of these structures, and recent insurance rates in New York have shown how fully they believed in their safety.— *Architecture and Building.*

NUMBER nine of the series of publications issued in pamphlet form by the British Fire Prevention Committee, London, and which has just come to hand, contains a paper on "Lessons from Fire and Panic," by Thomas Blashill, F. R. I. B.A., Superintending Architect to the London County Council.

Masons' Department.

ESTIMATING BRICKWORK.

BY F. E. KIDDER.

THE most general method of estimating common brickwork, and one that is very largely followed by brick contractors in all localities, is by the thousand bricks, measured by certain fixed rules, and figured at a certain price per thousand, wall measure, the price per thousand being generally uniform, while the adjustment for different kinds of work is made in the manner of measuring.

The principle underlying this system is explained as follows: —

"The plain dead wall of brickwork is taken as the standard, and the more difficult, complicated, ornamental, or hazardous kinds of work are measured up to it so as to make the compensation equal.

"To illustrate: if, in one day, a man can lay two thousand brick in a plain dead wall, and can lay only five hundred in a pier, arch, or chimney top in the same time, the cost of labor per thousand in such work is four times as much as in the dead wall, and he is entitled to extra compensation; *but instead of varying the price*, the custom is *to vary the measurement* to compensate for the difference in the time, and thus endeavor to secure a uniform price per thousand for all descriptions of ordinary brickwork, instead of a different price for the execution of the various kinds of work." *

The application of this system, as actually carried out by the brick contractors of Denver, is as follows: —

All walls are first reduced to thousands of brick by multiplying the external superficial area of the walls by 15, for walls 9 ins. thick; by 22½, for walls 13 ins. thick; by 30, for walls 17 ins. thick; and in the same proportion for thicker walls. No deduction is made for openings containing less than 80 superficial ft., and where deductions are made for larger openings, the width is measured 2 ft. less than the actual width. Hollow walls are also measured as if solid. To the number of bricks thus obtained is added the measurement for piers, chimneys, arches, etc.

Footings are generally measured in with the wall by adding the width of the projection to the height of the wall. Thus if the footings project 6 ins. on each side of the wall, 1 ft. is added to the actual height of the wall.

Chimney breasts and pilasters are measured by multiplying the girt of the breast or pilaster from the intersections with the wall by the height, and then by the number of bricks corresponding with the thickness of the projection. Flues in chimneys are always measured solid.

Detached chimneys and chimney tops are measured as a wall having a length equal to the sum of the side and two ends of the chimney, and a thickness equal to the width of the chimney. Thus a chimney measuring 3 ft. by 1 ft. 4 ins. would be measured as a 16 or 17 in. wall, 5 ft. 8 ins. long.

The rule for independent piers is to multiply the height of the pier by the distance around it in feet, and consider the product as the superficial area of a wall whose thickness is equal to the width of the pier. In practise, many masons measure only one side and one end of a pier or chimney.

Arches of common bricks over openings of less than 80 superficial ft. are usually disregarded in estimating. If the arch is over an opening larger than 80 sq. ft., the height of the wall is measured from the springing line of the arch. No deduction is made in the wall measurement for stone sills, caps, or belt courses, nor for stone ashlar, if the same is set by the brick-mason. If the ashlar is set by the stone-mason, the thickness of the ashlar is deducted from the thickness of the wall.

The sum of all of these measurements represents a certain number of thousands of bricks, and the whole is then multiplied by a common price per thousand, as $6, $8, $12, or $16, according to whatever the cost of plain brickwork may be. If the building is to be faced with pressed brick, *the actual cost* of the pressed brick, as nearly as it can be computed, is added to the estimated price of the common pressed-brick work, nothing being added for laying the pressed brick, nor anything deducted from the common brick measurement, the measurement of the common work displaced by the pressed brick being assumed to offset the difference in the cost of laying the pressed and common brick work.

In arriving at the cost of the pressed brick, the external superficial area of the walls faced with such brick is computed, and all openings, belt courses, stone caps, etc., deducted. 5 in. stone sills are not usually deducted. If a portion of the wall is covered by a porch, so that common brick may be used back of it, this space is also deducted. The net pressed-brick surface is then multiplied by 6, 6½, or 7 to obtain the number of bricks required, 6½ giving about the number of pressed bricks required to the square foot of the size used in Denver.

The topping out of the chimneys, if of face brick, is measured by girting the chimney and multiplying by the height, and adding the sum to the wall area. As a simple example of this system of estimating we will take a small brick house 28 by 32 ft. without cross walls, the basement walls to be 13 ins. thick, with footings 2 ft. 6 ins. wide; first-story walls, 13 ins. thick; second-story walls, 9 ins. thick; height of basement walls from trench to top of first floor joists, 8 ft. 6 ins.; from first-floor joists to top of second-floor joists, 10 ft. 6 ins.; from second-floor joists to plate, 9 ft.

Wall Measurement: —

Basement walls, equal 120 ft. (girt of building) × 9 ft. 10 ins. (height and projection of footing) × 22½; equals 26,550 bricks.

First-story walls, 120 ft. × 10 ft. 6 ins. × 22½; equals 28,360 bricks.

Second-story walls, 120 ft. × 9 ft. × 15; equals 16,200 bricks.

Topping out two chimneys, each 1 ft. 9 ins. × 1 ft. 5 ins., 14 ft. high above roof, equals 2 × 14 ft. × (1 ft. 5 ins. + 1 ft. 9 ins. + 1 ft. 5 ins.) × 30; equals 3,600 bricks.

Total brickwork equals 74,710 bricks; at $6.50 per thousand (present price in Denver), equals $485.60.

Pressed Brick. From grade to the under side of plate the wall measures 22 ft. 6 ins.; to be faced with $15 pressed brick of the common size.

The door and window openings measure 384 superficial ft.

Surface of pressed brick equals 120 × 22½, equals 2,700 sq. ft.

Deduct for openings,	384
	2,316 sq. ft.
Add for two chimneys, 2 × 14 × 6 ft. 4 ins. equals	177
	2,493 sq. ft.

2,493 × 6½ equals 16,204 pressed bricks, at $15 per thousand, equals $243.

Total amount of bid, $485.60, + $243, equals $728.60.

The above figures are supposed to include the necessary lime, sand, water, scaffolding, etc., required to make the mortar and put up the walls, and also a profit for the contractor, but anything in the way of ironwork, as ties, thimbles, ash doors, etc., are figured additional to the above.

(Continued.)

* From *Rules of Measurement* adopted by the Brick Contractors' Exchange of Denver, Col.

EFFECT OF MISTAKE IN STATEMENT OF AMOUNT.

UNDER the provisions of a mechanic's lien law, that claimant must make a just and true statement of the demand due him, his lien will not be defeated, though he claims too much in his statement, it being the result of honest mistake, and not an effort on his part to place a lien on the property for a greater amount than he honestly believes is due. — *Supreme Court, Mich.*

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.— Probably no branch of business has suffered more than the real-estate and building interests, but as many operations have been merely postponed, not abandoned, we do not feel any anxiety as to the ultimate result, and for those who have safely tided over the few months of dulness there will now be a period of activity, according to all indications.

Among the few items of real interest might be mentioned: —

In the recent competition for the new Free Public Library of Jersey City there were about fifty competitors, and the successful ones were Brite & Bacon, of New York. This was in every way a model competition and all architects and members of building committees would do well to study its history. The only criticism we would make as to the conditions is that too many small details were called for in them, matters not in any way related to the planning of the building, such as the "number of sixteen candle-power lights to be used," "provision for electric bells," etc. Messrs. James Brite and Henry Bacon, Jr., are very well known in New York and are considered one of the most promising of the younger firms of architects, the former having been associated with William Schickel & Co., and being the first winner of the Architectural League's Gold Medal. Mr. Bacon has been for many years with McKim, Mead & White, having been formerly a Boston man and winner of the Rotch scholarship. Their work is simple and dignified, showing the result of good scholarly training uncontaminated by French influence.



EAGLE ON DOME, PUBLIC LIBRARY AND MUSEUM, MILWAUKEE, WIS.
Executed by the Northwestern Terra-Cotta Company.
Ferry & Clas, Architects.

Charles C. Haight has planned a two-story brick warehouse to be built for the Trinity Corporation at a cost of $30,000.

Henry Anderson has prepared plans for an eight-story brick apartment house to be built on West End Avenue, corner 80th Street; cost, $300,000.

Ralph S. Townsend has planned a seven-story brick flat building to be erected on West End Avenue; cost, $175,000.

The same architect has also planned a six story brick apartment building to be erected on 80th Street, near West End Avenue; cost, $75,000.

C. P. H. Gilbert has prepared plans for a residence, five stories, to be built on Fifth Avenue near 74th Street; cost, $40,000.

M. W. Morris, architect, is preparing plans for two four-story brick and stone residences to be built in Brooklyn; cost, $50,000.

PHILADELPHIA. — The visitor to Philadelphia, architecturally as well as historically interested, may now note the result of recent changes in State House Row. Architect T. Mellon Rogers has had in hand for a year or more the delicate task of restoring not only the interior of the old building, but the exterior appearance of the entire group, as nearly as possible to the original condition. This required the demolishing of the wings connecting the State House with the Court Room and Congress Hall, in order to replace the low, two-story structures that originally flanked the main building to which they are connected by a high and disproportioned, but none the less quaint-looking arcade. All that remained to aid in the restoration were, over and above a very meager description, some quite inadequate cuts, but the result seems to justify the idea that we have now a fair representation of the original. The date, 1735, on the conductor heads seems to conflict somewhat with the new appearance of the brickwork, especially in the rear, where new bricks were used. Those who remember the old building as it was previous to this restoration may regret somewhat the removal of the Corinthian doorway from the front, but it is unmistakable that the entrance with its flat arch and heavy frame, as restored, looks older, more primitive, and more colonial. The first-story interior has not been changed materially, although the change seems great on account of the removal of the curios that lumbered the place before. The hallway now looks magnificent with an arcade opened up on one side, and the painting of the staircase in its old color. Altogether the changes have been instructive ones to the architect, and a material advantage accruing is the much more open side that Independence Square has to Chestnut Street.

The new width of Delaware Avenue, now being had by the moving out of the bulkhead line one hundred feet, is giving much-needed improvement to the architecture of the river front. The Pennsylvania & Reading Railroad ferry houses are nearing completion, the former being a two-storied copper front, with pilasters at intervals along the second story carrying a horizontal cornice, back of which stop the various roof slopes, while the latter takes the opposite tack, and uses the gable ends of the waiting room and shed roofs as the architectural features. The Pennsylvania work was designed by the company's architect, Mr. Cookman, the Reading work by Cope & Stewardson.

A number of old ramshackle buildings have been removed at the corner of 10th and Walnut Streets to make way for an extensive brick and stone addition to the Jefferson Hospital. Windrim & Son are the architects of the building, which, while not ornate, promises to be quiet and dignified.

The architecture of Philadelphia is perhaps best represented by suburban work. Many of the younger architects are represented solely in this way — whole districts, such as that known as Overbrook, being built up by the younger men. An architectural visitor to Philadelphia would find much to study at such places. At Overbrook is situated the Blind School, by Cope & Stewardson, which is now being finished. Its white plastered walls and dark brown tile roofs make it a prominent feature of the suburb.

Furness & Evans, architects of the Pennsylvania Railroad Station, are about to put up another skyscraper at the opposite corner of Market Street for the West End Trust Company. The designs have not yet been made public, but the firm's individual style in architecture is well known.

During a recent heavy rain storm in the city, when the unprecedented fall of over five inches took place within three hours, the drainage system of the business section was found sadly lacking in capacity. Water backed up the soil pipes, and poured out of closets, basins, and other erstwhile inlets, in many cases several stories above

ground. The City Hall suffered considerable damage in its basement, while many of the department stores turned their entire male force into a bucket brigade to save their stock.

CHICAGO.— After the failure of young Mr. Leiter's wheat venture his father is said to have raised $10,000,000 in cash within a very short period. Of this sum $2,000,000 was borrowed from an insurance company and secured by the Grand Pacific Hotel and other valuable pieces of property. But the most important transaction was the sale of one piece of business property to Marshall Field for $2,135,000. This ground had been previously leased by a department store concern, which now pays for its ground rental and some additional storerooms in the same block, more than $150,000 per year. In another year it will begin the erection of a building to cost $1,000,000, for which Messrs. Adler & Sullivan are associated architects. This same building was referred to in the June BRICKBUILDER.

Another $1,000,000 structure, but one not so certain as yet, is a coliseum, a fire-proof building, 420 by 625 ft. in extent. It has been designed by Mr. Beman, the architect of the former building. It is proposed to locate this most elaborate amusement enterprise on the lake shore, and include, beside provisions for Wild West shows and baseball games, a double-decked pier 1,500 ft. long, with pavilion for band concerts.

Omitting mention of some doubtful building schemes even greater than the foregoing, it may be noted that the University of Chicago has some new buildings under way, Henry Ives Cobb, architect.

Frost & Granger have designed several new depots for the Northwestern Railway.

In the line of commercial work, Armour & Co. are about to erect a $350,000 elevator. The Hansell-Elcock Foundry Company, who have been awarded contract for part of the $400,000 worth of constructional steel for the new post-office building, are to erect an addition to their plant 120 by 140 ft. in size. The Chicago Street Railroad is to make an addition to its office buildings.

The Chicago Portland Cement Company expects soon to erect a plant in Illinois capable of producing 500 bbls. per day. The Titan Steel Company is said to be ready to construct a large steel plant at Pullman.

For building news which is not so agreeable from a business point of view, it may be noticed that an office building was lately transferred by foreclosure of mortgage. The fine Schiller Building, which cost $850,000, has gone into the hands of a receiver. The Dubuque Apartment Building, whose construction cost three years ago over $100,000, has just been sold for $20,500, to satisfy lien holders. There are more of the same sort. Some are due to wild and questionable financiering, and others, doubtless, to "hard times."

Another disastrous fire has occurred in Chicago. This time it was an inflammable apartment building. Firemen were commended publicly for heroism in saving eighteen lives, but four others perished. What the laws fail to do public sentiment may be able to accomplish after many lives are sacrificed to pay for the education of that sentiment. Since the Wabash Avenue horrors numbers of tenants have been known to move from similar fire traps to the buildings constructed of steel and hollow tile.



FRONT ELEVATION, MUSEUM BUILDING, NEW YORK BOTANICAL GARDEN.
R. W. Gibson, Architect.
For detail sheet see Plates 61 and 62.



ST. MARK'S SCHOOL, SOUTHBORO, MASS.
Henry Forbes Bigelow, Architect.

ST. LOUIS.— There is little of interest in the architectural field, the universal complaint among architects and builders being that they never experienced less activity, but almost every one is possessed with a spirit of hopefulness, believing there will be a general awakening of the building interests with the beginning of another year.



STATE ASYLUM FOR THE CHRONIC INSANE, WERNERSVILLE, PA.
Rankin & Kellogg, Architects.

A greater part of the work commenced in the early part of the year is either completed or nearly so. The Hargadine, McKittrick Building has just been occupied. It fills the intervening space between the Mallinckrodt Building on 9th Street and the Martin Building on 10th Street, extending through from Washington Avenue to Lucas Avenue. The building is eight stories and a good example of mill construction. The architects, Messrs. Eames & Young, have handled the Washington Avenue front very interestingly. The entire façade is in white stone. The Palladian motive has been employed in the frieze story, and in the spandrels are female figures in bold relief. It is encouraging to see such an effort made to make our commercial buildings good to look upon. The Lucas Avenue front has been made much simpler, and gray brick and terra-cotta have been used instead of stone. As the building is something like 250 ft. long with light only from each street, Luxfer prisms enter largely as a feature in the fronts.

The Benoist Building, on the corner of 9th and Pine Streets, has been completed. The building was designed to be ten stories, but only six stories have been built. The face is of red brick and terra-cotta. The floors have been formed with what might be called concrete joist, that is, concrete beams with iron bars have been placed close together and terra-cotta blocks have been fitted between the beams at the bottom, forming a level ceiling. C. D. McArdle is the architect and James D. McGee the engineer.

The large nine-story warehouse on the corner of 12th Street and Washington Avenue, being built by H. E. Roach & Sons for Mr. A. D. Brown, is also nearing completion. The two first stories are of white stone, and above the building is faced on three sides with cream-enameled brick.

Work continues at intervals on the new City Hall, the contract for the finishing of the chambers for the Council and House of Delegates having recently been awarded to Porter, White & Co., for $59,000.

A movement has again been inaugurated in the municipal assembly to widen 12th Street between Choteau Avenue and Cass Avenue and is meeting with more support than any previous effort, and 12th Street property owners are hopeful that their dream of a grand commercial boulevard in the near future may materialize. Should the scheme become an accomplished fact there is little doubt but it would become the retail center of the city in a very short time.

MINNEAPOLIS.— There has been a gratifying growth in public sentiment towards the use of brick as a material for street paving. At first asphalt was the only material that our city officials would consider, owing, it is suspected, to the fact that the "asphalt combine" owned the city council, and were awarded contracts year after year, at advance of 30 or 40 per cent. over brick, and against the remonstrances of the interested property owners to a large extent. The result has been just what might have been expected. The asphalt ring soon came to believe that they had a life "sinch," and they proceeded to run matters to their own satisfaction, and ignored public opinion as well as the terms of their contracts, by not doing their work properly, and then failing, in numerous instances, to make their work good as called for. They have been turned down to a large extent this year, and we are going to have a fair and full trial of vitrified brick on some of our principal streets.

One interesting phase of this matter is the position the bicycling fraternity has taken. At the outset asphalt was the only paving material they would consider. Now that they have had a fair trial of both, they appear to favor brick, and desire a path of that material on all asphalt pavements. We have also found that the asphalt will not wear in the gutters where there is dampness, and where horses are allowed to stand. They are now laying brick in the gutters and cutting the asphalt out. We also see the advantage of brick where there is tearing up of pavement for the laying of pipes. It means a permanent disfigurement. In our climate asphalt is certainly not the ideal material for pavements.

The corner stone of our new State Capitol Building was laid at St. Paul last week with great ceremony, the venerable Ex-Governor Ramsey handling the trowel. It was made the occasion of a two days' jubilee by the St. Paulites, who see therein a settlement of the capitol removal question for the next century, at least. Work on the superstructure is being pushed at present and will be until completion.

A new factor in the brick industry has entered into the local market during the past two or three years. It is a local concern with ample financial backing, who are making a specialty of producing difficult shades of brick to satisfy the demands of exacting architects, and they appear to be meeting those demands in a satisfactory manner. They have filled special orders in the Twin Cities that no other concern pretends to be able to produce. Some of the shades they turn out are a delight to an artistic eye, and we all hope that they will be able to match these varying shades sufficiently well to establish confidence in their ability to produce them on short notice, and



STATE ASYLUM FOR THE CHRONIC INSANE, WERNERSVILLE, PA.
Rankin & Kellogg, Architects.



DETAIL, BUILDING, JOHN ST., NEW YORK CITY.
Executed in white terra-cotta by the Excelsior Terra-Cotta Company; Ralph S. Townsend, Architect.

that they are to prove permanent, which latter seems assured when one looks into their methods of manufacture. The entrance of a new competitor has had a wholesome effect on the other people, who had the field nearly to themselves.

In the line of improvements now under way and to be done this season may be mentioned the following:—

Two new school buildings, eight rooms each, to cost $15,000 each; E. S. Stebbins, architect.

Business building for Thorpe Brothers, cost, $35,000; Fred Kees, architect. City Hospital, two main buildings, 40 by 225 ft. with Administration Building, 60 by 80 ft., three stories, to cost complete $250,000; the east wing only to be built this year, at cost of $60,000. Architects, MacLeod & Lamoreaux.

The old Grand Opera House has been remodeled into a six-story business building at a cost of $125,000; Fred Kees, architect.

A new residence for S. A. Harris, cost, $30,000; Bertrand & Chamberlin, architects. Residence for G. H. Partridge on Lowry Hill, to cost $30,000; Fred Kees, architect.

Passenger Station, C. M. & St. P. Railway Company, cost, $150,000; architect, Chas. S. Frost, of Chicago.

ST. PAUL.

Addition to Union Railway Station, to cost $55,000; architect, C. S. Frost, Chicago.

New passenger station for Northern Pacific Railway Company, at Fargo, N. D., to cost $30,000; architect, Cass Gilbert.

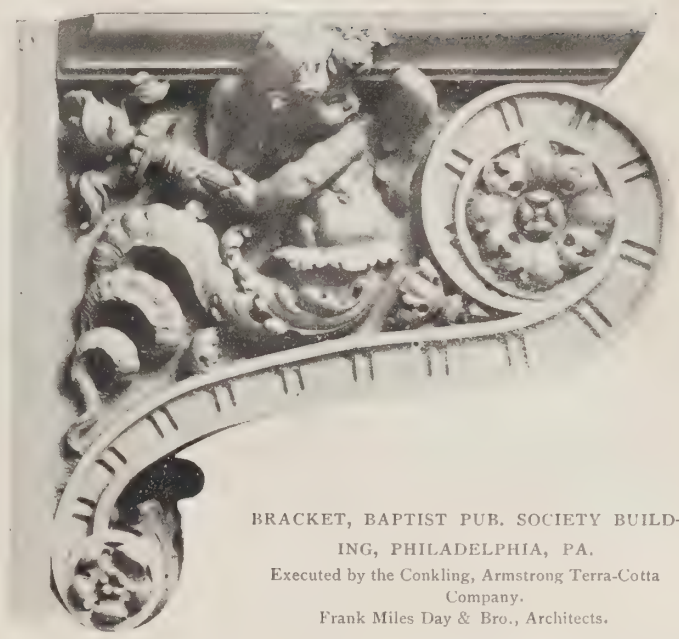
Catholic Cathedral at Fargo, N. D., cost, $25,000; architects, Bassford & Donahue.

Norwegian Lutheran Seminary at Hamline, Minn.; cost, $50,000; architects, Buechner & Jacobsen.

All the above buildings are of brick, mostly of pressed brick. There is a growing tendency in the practise of the best architects to aim at satisfactory effects by use of unselected brick, as to shades, and the results thus far attained have amply sustained this tendency. There is also a noticeable leaning towards brick as the only building material that will stand satisfactorily through all emergencies, as demonstrated in the recent large fires at Philadelphia and elsewhere.

NEW TRADE PUBLICATION.

THE Ohio Mining and Manufacturing Company, Shawnee, Ohio, New York office 44 Pine Street, has recently issued an exceptionally interesting and attractive catalogue especially prepared for the use of architects, as a practical guide in drawing up specifications for the Shawnee Brick.



BRACKET, BAPTIST PUB. SOCIETY BUILDING, PHILADELPHIA, PA.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Frank Miles Day & Bro., Architects.

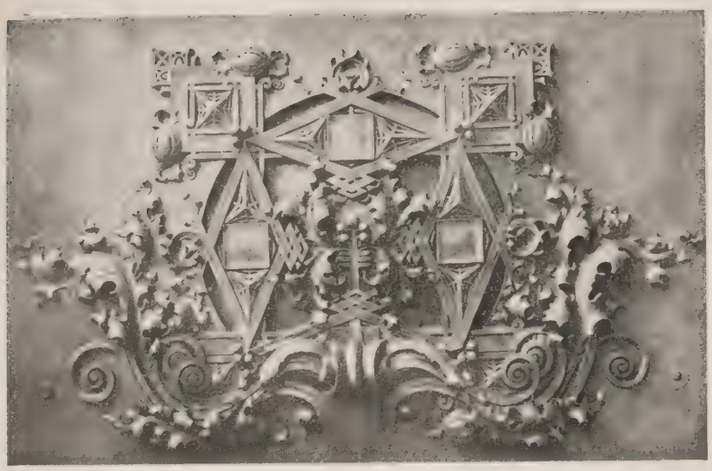
The able and consistent manner with which the purpose of the catalogue is maintained throughout is particularly gratifying, every page being devoted to pertinent information relative to the subject in hand. In the opening pages the character and quality of the product are conservatively mentioned in a brief introduction. A short description follows of the various colors, grades, and sizes of their brick. To facilitate ordering, there is explained a simple yet comprehensive system of distinguishing by a method of classification any brick desired. Several pages are devoted to scale drawings of arches, with rules for specifying brick for same.

A particularly interesting feature of the catalogue is the half-tone illustrations (one half reduction) and full-sized profile drawings of over ninety different shapes of molded brick made by the company.

Lack of space permits us to touch upon only a few of the salient



UNITED STATES APPRAISERS' WAREHOUSE, NEW YORK CITY.
Seven hundred and sixteen thousand face brick used in this building, furnished by the Washington Hydraulic-Press Brick Company through their agents, Fredenburg & Lounsbury, New York City.
William Martin Aiken, Architect.



PANEL, FOURTH STORY BAYARD BUILDING, NEW YORK CITY.
Executed by the Perth Amboy Terra-Cotta Company.
Louis H. Sullivan and Lyndon P. Smith, Architects.

features of the catalogue. A perusal of its pages will develop many other points of interest. We are confident that the book will be highly appreciated among the architectural profession as a work of reference. Parties desiring copies should communicate with the company either at Shawnee, Ohio, or 44 Pine Street, New York.

CURRENT ITEMS OF INTEREST.

The Union Akron Cement Company, Buffalo, N. Y., are furnishing their cement for a large business block at Akron, Ohio, and also for the brick paving being laid at Meadville, Pa.

H. F. Mayland & Co., New York agents of the Burlington Architectural Terra-Cotta Company, are supplying the architectural terra-cotta for a large store building being erected at Brooklyn, N. Y.

Sayre & Fisher Company are furnishing the limestone gray brick being used in the construction of the new Metal Exchange Building, corner John and Clift Streets, New York City, Clinton & Russell, architects.

H. E. Fuller & Co., Boston, New England agents for the Burlington Architectural Terra-Cotta Company, have contracted to supply the architectural terra-cotta for a new business block at Holyoke, Mass., George P. Alderman, architect.

The Illinois Supply and Construction Company, St. Louis, Mo., who represent the Tiffany Enameled Brick Company in that district, are supplying 100,000 9 by 4½ in. enameled blocks, to be used in the new Brown Building, 12th Street and Washington Avenue, St. Louis.

Sayre & Fisher Company are furnishing the limestone gray brick being used in the construction of the addition to the main building of the Metropolitan Museum of Art, Central Park, New York City, R. H. Hunt, architect. The brick are of common size, and the order calls for more than 200.000.

The Fall River Bleachery, at Fall River, Mass., have placed the contract for their new mill with the Berlin Iron Bridge Company, of East Berlin, Conn. The building is 65 ft. wide and 200 ft. long with side walls of stone, the supporting framework being made of steel.

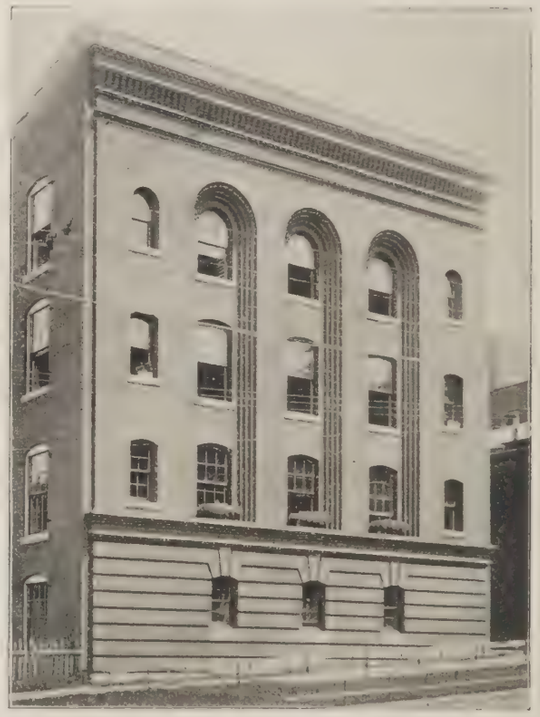
The New Haven Gas Light Company, of New Haven. Conn., have placed the contract with the Berlin Iron Bridge Company, of East Berlin, Conn., for their new fire-proof coal shed. The building is 60 ft. wide and 500 ft. long. The framework of the building is steel.

The American Mason Safety Tread Company has established agencies in a dozen of the larger cities throughout the country, from which good returns are expected, as real-estate owners and architects learn the efficiency of Mason Safety Tread as a protective device, and one to lengthen the wear of stairways. Great interest is being shown, especially in the use of this product for stairs in schoolhouses, as it provides a convenient and economical solution to a serious problem.

The American Enameled Brick and Tile Company are furnishing the enameled brick for lining the swimming tank of the new University Club, New York City, McKim, Mead & White, architects; C. T. Wills, builder; and about 80,000 semi-glazed brick to be used in the side and rear elevation of the Gugenheimer mansion, Fifth Avenue, New York City, Robert Maynicke, architect. These bricks will have the same finish as those used in the new Dunn Building, New York City.

The New England Sanitary Product Company are erecting at Old Harbor Point, Mass., near Boston, an absolutely fire-proof building 120 ft. wide and about 130 ft. long. The building is two stories high, and is of skeleton steel framework style, consisting of steel columns built in the walls, carrying heavy steel floor beams and girders, and clear span roof trusses which support the roof. The structural steel work in this plant was designed and is being furnished and erected by the Berlin Iron Bridge Company, of East Berlin, Conn.

The White Brick and Terra-Cotta Company has secured



WELLS & RICHARDSON CO.'S MANUFACTURING BUILDING,
BURLINGTON, VT.
W. R. B. Willcox, Architect.

contracts to furnish the architectural terra-cotta for the following buildings: Public school at Queens, L. I., architects, Boring & Til-

ton; apartment house, 327 W. 83d Street, New York City, architect, H. E. Hartwell; primary school, New Rochelle, N. Y., architect, Geo. H. Pierce; Stores and lofts, 56 Thomas Street, New York City, architects, Quinby & Broome; Cheeseborough Building, corner State and Pearl Streets, New York City, architects, Clinton & Russell; Hopkins apartments, 216–218 W. 16th Street, New York City, architects, Boring & Tilton; residence and stable at Great Neck, L. I., for Mr. James E. Martin, architects, Little & O'Connor.



MELLON BLOCK, PITTSBURGH, PA.

Alden & Harlow, Architects. Architectural terra-cotta furnished by the Northwestern Terra-Cotta Co.

THE copartnership heretofore existing between R. W. Allison, S. B. Goucher, W. B. Goucher, Samuel McAdoo, Frank Bowles, and W. H. Garlick, under the firm name of Empire Fire-Proofing Company, has been dissolved by mutual consent, and the assets and good-will have been assigned to a new company, organized under the laws of the State of New Jersey, which will continue the business under the name of Empire Fire-Proofing Company. Mr. R. W. Allison is the president and general manager of the new company; and Mr. John A. Hammett, who has had charge of the business at the Chicago office, under the former management, will continue same as vice-president of the new company. The general offices of the company are in the German National Bank Building, Pittsburgh, Pa., with branch offices in Monadnock Block, Chicago, Ill., 874 Broadway, New York, and Builders' Exchange, Philadelphia.

THE CELADON TERRA-COTTA COMPANY, LTD., have secured through their Buffalo agent, John H. Black, the contracts to furnish their roofing tiles on the three following buildings: —

Office Building, American side Niagara Falls, for Clifton and Niagara Falls Suspension Bridge Company (6 in. Conosera), R. A. Wallace, of Buffalo, architect.

Francis Xavier Parish House, Black Rock, N. Y. (10 in. Conosera), Carl Schmidt, of Buffalo, architect.

Band Stand, Delaware Park, Buffalo (8 by 2 in. Conosera), Loverin & Whelan, of Buffalo, architects.





Fireplace Mantels.



The best ones to buy are those we make of Ornamental Brick. There's nothing else as good or as durable. Our mantels don't cost any more than other kinds, and are far better in every way—our customers say so. Don't order a mantel before you have learned about ours. Send for our Sketch Book showing 53 designs of mantels costing from $12 upwards.

Phila. & Boston Face Brick Co.,
15 LIBERTY SQ., BOSTON, MASS.



INDEX TO ADVERTISEMENTS.

ADDRESS. PAGE

ACETYLENE GAS GENERATORS.
Napheys Acetylene Gas Generators xxxii
J. B. Colt & Co., 3, 5, & 7 W. 29th St., New York.

ADVANCE BUILDING NEWS REPORTS.
The F. W. Dodge Co. xxxiii

ARCHITECTURAL FAIENCE MANUFACTURERS. (See Clay Manufacturers' Agents.)
Atwood Faience Company, Hartford, Conn. xxvi
New York Agents, Pfotenhauer & Nesbit, Metropolitan Building, New York City
The Grueby Faience Company, 164 Devonshire Street, Boston xxvi
Philadelphia Agent, O. W. Ketcham, 24 So. 7th St.
New York Agent, 287 Fourth Ave.
Chicago Agent, C. T. Harris & Co., Marquette Bldg.

ARCHITECTURAL INSTRUCTION.
Correspondence School of Architecture, Scranton, Pa. xxxii
Harvard University, Lawrence Scientific School ii

ARCHITECTURAL TERRA-COTTA MANUFACTURERS. (See Clay Manfrs.' Agents.)
American Terra-Cotta and Ceramic Company, Marquette Bldg., Chicago, Ill. . ix
Atlantic Terra-Cotta Company vii
287 Fourth Ave., New York City.
Brick, Terra-Cotta and Supply Co., Corning, N. Y. x
Burlington Architectural Terra-Cotta Co., Burlington, N. J. ii
Conkling-Armstrong Terra-Cotta Company, Builders' Exchange, Philadelphia . v
Evens & Howard Fire Brick Co., 920 Market St., St. Louis, Mo. . . . xii
Excelsior Terra-Cotta Company, 105 East 22d St., New York City . . . iv
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Fiske, Homes & Co., 164 Devonshire St., Boston x
New York Office, Charities Building, 289 4th Ave. Philadelphia Office, 24 South 7th St.
Gladding, McBean & Co., San Francisco, Cal. ii
Indianapolis Terra-Cotta Co., Indianapolis, Ind. viii
New York Architectural Terra-Cotta Company, 38 Park Row, New York City . xxviii
New England Agents, Fiske, Homes & Co., 164 Devonshire St., Boston.
Philadelphia Office, 1341 Arch St.
New Jersey Terra-Cotta Company, 108 Fulton St., New York City . . . vii
Perth Amboy Terra-Cotta Company, New York Office, 160 Fifth Ave. . . vi
Boston Agents, Waldo Bros., 102 Milk St.
Standard Terra-Cotta Company, 287 Fourth Ave., New York City . . . vi
Boston Agents, O. W. Peterson & Co., John Hancock Building.
Philadelphia Agent, W. L. McPherson, Building Exchange.
The Northwestern Terra-Cotta Company, Room 1118, The Rookery, Chicago . ix
White Brick and Terra-Cotta Company, 156 Fifth Ave., New York City . . viii
Winkle Terra-Cotta Co., Century Building, St. Louis, Mo. viii

BRICK MANUFACTURERS (Pressed and Ornamental). (See Clay Manfrs.' Agents.)
Brick, Terra-Cotta and Supply Co., Corning, N. Y. x
Brush & Schmidt, Office, 2 Builders' Exchange, Buffalo, N. Y. x
Conkling-Armstrong Terra-Cotta Company, Builders' Exchange, Philadelphia . v
Columbus Brick and Terra-Cotta Company, Columbus, Ohio xiii
Dagus Clay Manf'g Co., Office, Ridgway, Pa.: Works, Daguscahonda, Pa . xiv
Day Brick Company, Belleville, Ill. ii
Evens & Howard Fire Brick Co., 920 Market St., St. Louis, Mo. . . . xii
Fiske, Homes & Co., 164 Devonshire St., Boston x
New York Office, 289 Fourth Ave.
Philadelphia Office, 24 So. 7th St.
Gladding, McBean & Co., San Francisco, Cal. ii
Harbison & Walker Co., The. Office, 22d and Railroad Sts., Pittsburg, Pa. . xv
Hydraulic-Press Brick Co. xii
Home Office, Union Trust Building, St. Louis, Mo.
Illinois Supply and Construction Co., St. Louis, Mo. xii
Kittanning Brick and Fire Clay Co., Duquesne Way and 10th St., Pittsburgh, Pa. xi
Merwin, C. P. Brick Co., Berlin, Conn. xiii
New York and New Jersey Fire-proofing Company, 156 Fifth Ave., New York City. xxi
Ohio Mining and Manufacturing Co.: Office, 44 Pine St., N. Y.; Works, Shawnee, Ohio xv
Penn Buff Brick and Tile Co., Prudential Building, Newark, N. J. . . . ii
Pennsylvania Enameled Brick Company, Townsend Building, New York City . xvi
Philadelphia Agent, O. W. Ketcham, Builders' Exchange.
Perth Amboy Terra-Cotta Company, New York Office, 160 Fifth Ave. . . vi
Boston Agents, Waldo Bros., 88 Water Street.
Philadelphia Office, 1044 Drexel Building.
Philadelphia and Boston Face Brick Co., 4 Liberty Sq., Boston 171
Powhatan Clay Manufacturing Company, Richmond, Va. xli
Raritan Hollow and Porous Brick Co., 874 Broadway, New York City . . xx
Ridgway Press-Brick Co., Ridgway, Pa. xiv
New England Agents, G. R. Twichell & Co., 19 Federal St., Boston.
New York Agent, O. D. Person, 160 Fifth Ave.
Sayre & Fisher Co., Jas. R. Sayre, Jr., & Co., Agents, 207 Broadway, New York xvii
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Tiffany Enameled Brick Company, New Marquette Building, Chicago . . xvi
White Brick and Terra-Cotta Company, 156 Fifth Ave., New York City . . viii

BRICK MANUFACTURERS (Enameled). (See Clay Manufacturers' Agents.)
American Enameled Brick and Tile Co., 14 East 23d St., New York. xvii
American Terra-Cotta and Ceramic Company, Marquette Bldg., Chicago, Ill. . ix
Atwood Faience Company, Hartford, Conn. xxvi
Fiske, Homes & Co., 164 Devonshire St., Boston x
New York Office, 289 Fourth Ave. Philadelphia Office, 24 So. 7th St.
Grueby Faience Co., 164 Devonshire St., Boston xxvi
Illinois Supply and Construction Co., St. Louis, Mo. xii
Pennsylvania Enameled Brick Company, Townsend Building, New York City . xvi
Raritan Hollow and Porous Brick Co., 874 Broadway, New York City . . xx
Sayre & Fisher Co., Jas. R. Sayre, Jr., & Co., Agents, 207 Broadway, New York xvii
New England Agent, Charles Bacon, 3 Hamilton Place, Boston.
Tiffany Enameled Brick Company, New Marquette Building, Chicago . . xvi

BRICK PRESERVATIVE AND WATER-PROOFING.
Cabot, Samuel, 70 Kilby St., Boston ii
Gabriel & Schall, 205 Pearl St., New York xxxi

BRIDGE AND BUILDING, IRON WORKERS.
Berlin Iron Bridge Co., Berlin, Conn. xxxii

CEMENTS.
Alsen's Portland Cement, 143 Liberty St., New York City xxx
Berry & Ferguson, 102 State St., Boston xxxii
Commercial Wood and Cement Company, Girard Building, Philadelphia, Pa. . xxx
New York Office, 156 Fifth Avenue.
Cummings Cement Co., Ellicott Square Bldg., Buffalo, N. Y. xxxi
Davis, James A. & Co. xxx
Office, 92 State St., Boston.
French, Samuel H., & Co., York Avenue, Philadelphia, Pa. xxxi
Gabriel & Schall, 205 Pearl St., New York xxxi
Lawrence Cement Company, No. 1 Broadway, New York City xxxi

ADDRESS. PAGE

CEMENTS.—*Continued.*
Lesley & Trinkle, 22 and 24 So. 15th St., Philadelphia xxxi
Manhattan Concrete Co., 156 Fifth Ave., New York xxxi
New York & Rosendale Cement Company, 280 Broadway, New York City . xxxi
New England Agents, Van Name & Co., Hartford, Conn.
James C. Goff, 31-49 Point St., Providence, R. I.
The J. S. Noble Co., 208 Lyman St., Springfield, Mass.
Lord Bros. & Co., Portland, Me.
Thiele, E., 78 William St., New York City xxx
Union Akron Cement Company, 141 Erie St., Buffalo, N. Y. xxx
Waldo Brothers, 102 Milk St., Boston xix

CEMENT MACHINERY.
Sturtevant Mill Co., Boston xxxi

CLAY MANUFACTURERS' AGENTS. Brick (Front Enameled and Ornamental), Terra-Cotta, Architectural Faience, Fire-proofing, and Roofing Tiles.
Black, John H., 33 Erie Co. Savings Bk. Bldg., Buffalo, N. Y. xi
Illinois Supply and Construction Co., St. Louis, Mo. xii
Ketcham, O. W., Builders' Exchange, Philadelphia iii
Lippincott, E. P., & Co., 24 Builders' Exchange, Baltimore, Md., and 808 F St., N. W., Washington, D. C. x
Mayland, H. F., 287 Fourth Ave., New York City iii
Meeker, Carter, Booraem & Co., 14 E. 23d St., New York City xxiii
Peterson, O. W., & Co., John Hancock Building, Boston iii
Twichell, G. R. & Co., 166 Devonshire St., Boston xi
Waldo Brothers, 102 Milk St., Boston xix
Willard, C. E., 192 Devonshire St., Boston xix

CLAYWORKERS' CHEMICALS AND MINERALS.
Gabriel & Schall, 205 Pearl St., N. Y. xxxi
F. W. Silkman, 231 Pearl St., New York xxxi

CLAYWORKING MACHINERY.
American Clay Working Machinery Co., Bucyrus, Ohio xxxix
Chambers Bros. Company, Philadelphia, Pa. xxxix
Chisholm, Boyd & White Company, 57th and Wallace Sts., Chicago . . xxxix
Eastern Machinery Co., New Haven, Conn. xl
Simpson Brick Press Co., 415 Chamber of Commerce, Chicago, Ill. . . . xl
The F. D. Cummer & Sons Co., Cleveland, Ohio xxxviii

ELEVATORS.
Eastern Machinery Co., New Haven, Conn. xl
Moore & Wyman, Elevator and Machine Works, Granite St., Boston . . xxxviii

FIRE-PROOFING MATERIAL MANUFACTURERS. (See Clay Manufacturers' Agents.)
Boston Fire-proofing Co., 166 Devonshire Street, Boston xxii
Central Fireproofing Co., 874 Broadway, New York xxv
Empire Fireproofing Co., 1301 Monadnock Block, Chicago xx
Fawcett Ventilated Fire-proof Building Co., Bourse Building, Philadelphia . xxiv
New York Agent, F. L. Douglass, St. James Building, 26th St. and Broadway.
Boston Agent, James D. Lazell, 443 Tremont Bldg.
Fiske, Homes & Co., 164 Devonshire St., Boston x
Gladding, McBean & Co., San Francisco, Cal. ii
Guastavino, R., 9 East 59th St., New York xx
Boston Office, 444 Albany Street.
Maurer, Henry, & Son, 420 E. 23d St., New York City xxiii
New York & New Jersey Fire-proofing Company, 156 Fifth Ave., New York City xxi
Pioneer Fire-proof Construction Co., 1515 Marquette Building, Chicago . . xxi
Pittsburg Terra-Cotta Lumber Company, Carnegie Building, Pittsburg, Pa. . xxi
New York Office, Townsend Building, Broadway and 25th Street
Powhatan Clay Manufacturing Company, Richmond, Va. xli
Standard Fireproofing Co., 41 Cortlandt St., New York xxi

GRANITE.
Gilbreth Seam-Face Granite Co., 85 Water St., Boston xxxiv

HANGERS.
McCabe Manufacturing Co. xxxvi
557 W. 22d St., New York City.

MAIL CHUTES.
Cutler Manufacturing Co., Rochester, N. Y. v

MASONS' SUPPLIES.
Gilbreth Scaffold Co., 85 Water St., Boston xxxv
Hamblin & Russell Manfg. Co., Worcester, Mass. xxxvi
Waldo Brothers, 102 Milk St., Boston xix

MORTAR COLORS.
Clinton Metallic Paint Company, Clinton, N. Y. xxxi
French, Samuel H., & Co., Philadelphia, Pa. xxxi

MURESCO.
Moore, Benjamin & Co., Brooklyn, N. Y. xxxv

PRESERVATIVE COATINGS.
Smith, Edw., & Co., 45 Broadway, N. Y. xxvi

PLUMBING GOODS.
Randolph & Clowes, Waterbury, Conn. xxxvi

ROOFING TILES MANUFACTURERS. (See Clay Manufacturers Agents.)
The Celadon Terra-Cotta Co., Limited xxvii
Main Office and Factory, Alfred, N. Y.
Chicago Office, Marquette Building.
New York Office, 1120 Presbyterian Building, New York City.

SAFETY TREAD.
The American Mason Safety Tread Co., 40 Water St., Boston xxxii

SNOW GUARDS.
Folsom Patent Snow Guard, 116 South St., Boston, Mass. xxxvi
Hamblin & Russell Mfg. Co., Worcester, Mass. xxxvi

VENTILATORS.
Pancoast Ventilator Co., The. 316 Bourse Building, Philadelphia, Pa. . . xxxvii

WALL TIES.
Cleveland Pat. Steel Wall Ties. Wason, Hamilton, and Dart Sts., Cleveland, Ohio xxxvi
Hamblin & Russell Manfg. Co., Worcester, Mass. xxxvi
Morse Patent Wall Ties. J. B. Prescott & Son, Mfrs., Webster, Mass. . . xxxvi

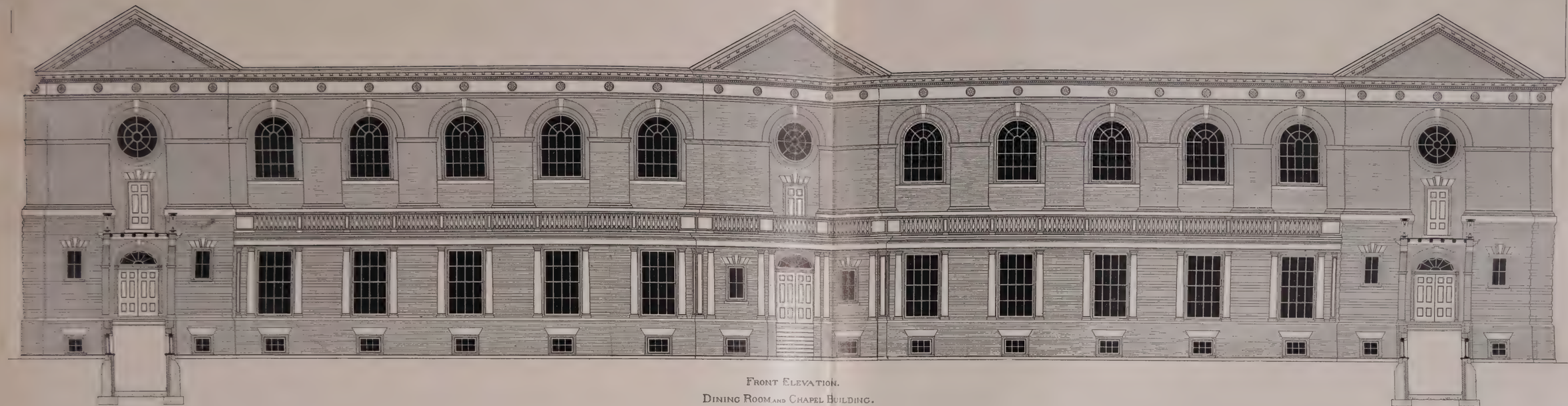
WINDOW SASH AND PULLEYS.
Queen Sash Balance Co., 150 Nassau St., New York xxxvii
The Shull Overhead Window Pulley, 116 South St., Boston xxxvii
100 Park Place, New York.
The Bolles Sash Co., 150 Nassau St., New York xxxvii



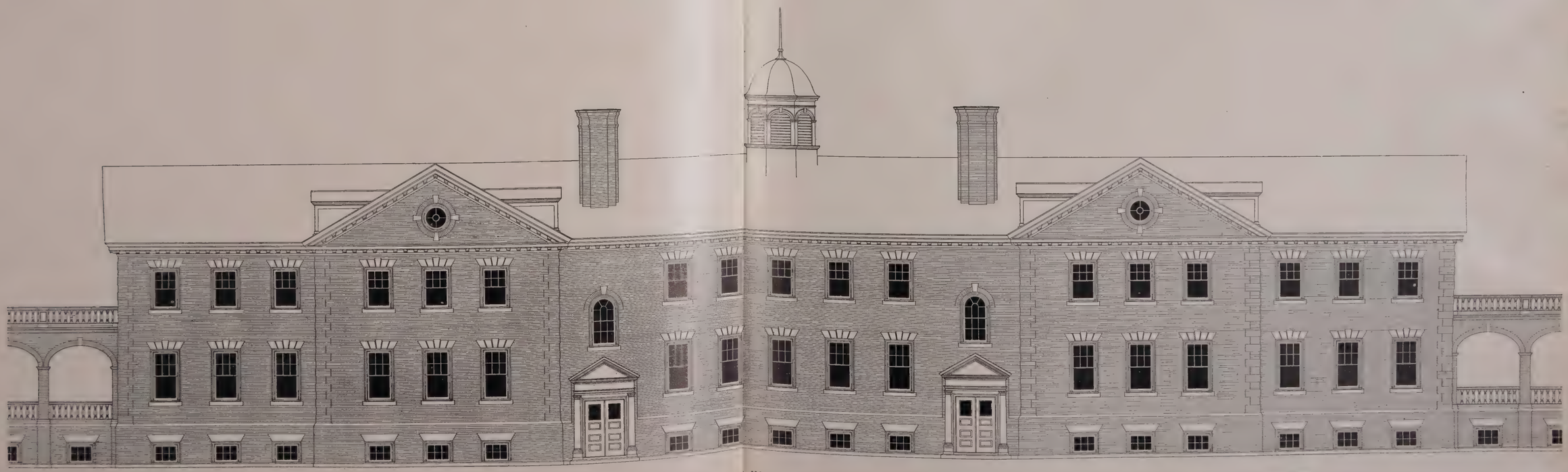
FRONT ELEVA
DINING ROOM AND CHAP



FRONT ELEVA
STATE ASYLUM FOR CHRO
RANKIN &



FRONT ELEVATION.
DINING ROOM AND CHAPEL BUILDING.

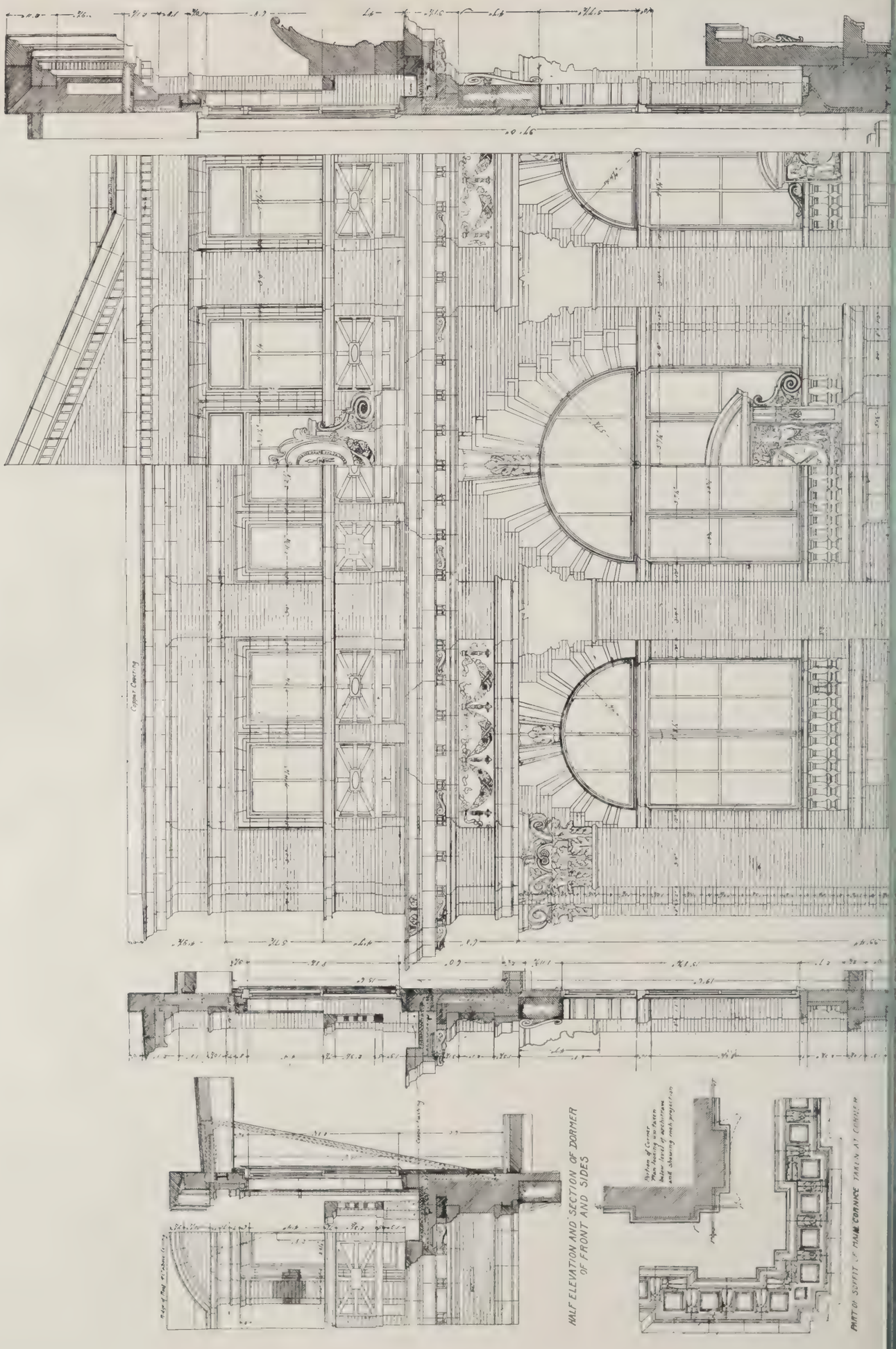


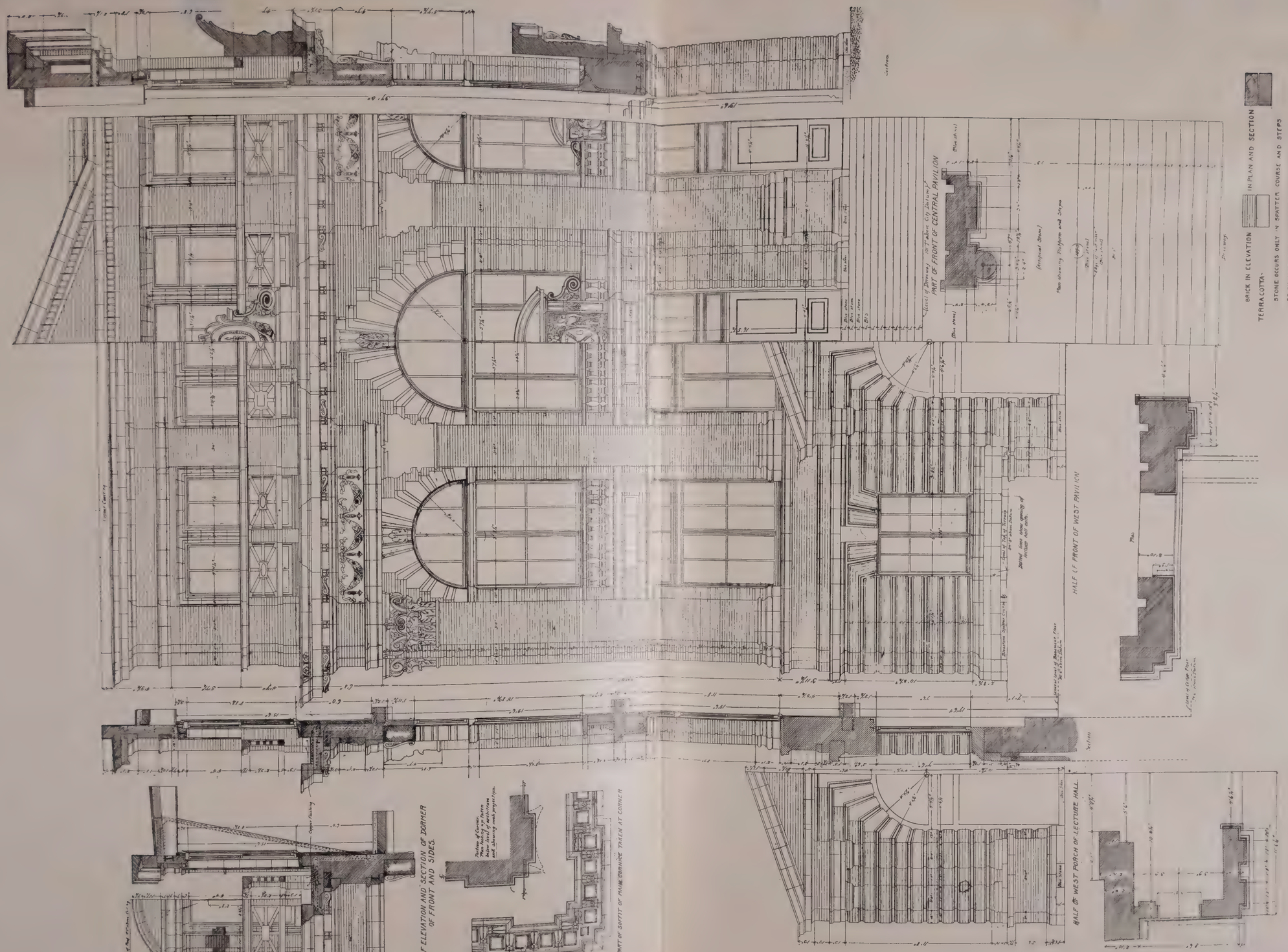
FRONT ELEVATION, WARD BUILDING.

STATE ASYLUM FOR CHRONIC INSANE, WERNERSVILLE, PA.

RANKIN & KELLOGG, ARCHITECTS.

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Copper Covering
HALF ELEVATION AND SECTION OF DORMER OF FRONT AND SIDES
PART OF SOFFIT OF MAIN CORNICE TAKEN AT CORNER



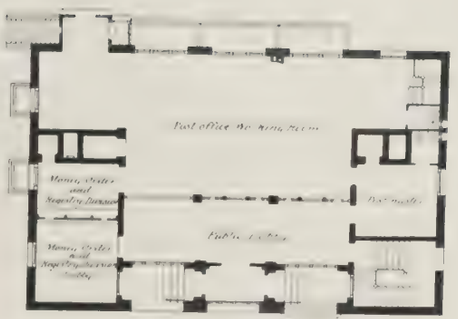
Details of Exterior Walls.

Museum Building, New York Botanical Garden, New York City.

R. W. Gibson, Architect.

For ... tion see page 171.

BOSTON PUBLIC



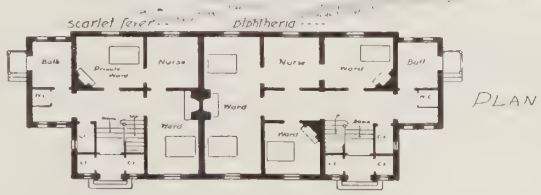
Plan of First Floor

Second Street (Front) Elevation.

U. S. POST OFFICE, POTTSVILLE, PA.

JAMES KNOX TAYLOR, Supervising Architect.





PLAN

PUBLIC LIBRARY

ISOLATING BUILDING FOR CONTAGIOUS DISEASES, DISTRICT OF COLUMBIA.

EDWARD W. DONN, JR., ARCHITECT.

VOLVME VII SEPT. 1898 No. 9

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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RESPONSIBILITY OF THE ARCHITECT.

IT used to be said of a well-known Boston architect, long since gone over to the majority, that he had a number of wealthy clients who every year would make over to him a considerable sum of money, telling him to invest it in real estate at his discretion, and would give the matter no further thought until the completed building which the architect saw fit to erect was turned over to its owner. This particular architect enjoyed a high reputation, was deserving as an investor no less than for his ability as an architect, and to that extent was exceptional; and yet though few of us have the opportunities which he seemed to be able to utilize to such good advantage, it is a fact that the responsibilities of the architect are large. The obliging owner who will hand his architect ten thousand dollars before departing for Europe, as described so felicitously by Mr. Rich in his article in our last number, are few and far between; but the number who, perhaps without knowing it, entrust their fortunes and their future happiness to the architect are many, and we fancy are becoming more numerous every year. An educated architect in good practise enjoys a degree of responsibility such as falls to the lot of few professional men. A client sometimes thinks he knows what his house is to be. He has a feeling that he has designed his own house and simply told his architect what to do, when, as a matter of fact, it is the architect's house that is built and not the owner's, and the owner is obliged to depend upon the taste, discretion, and good judgment, as well as the honesty of his professional adviser. We believe an architect is more inclined to err by avoiding responsibility of this sort than by accepting it, and that the success of a building is in no inconsiderable degree measured by the extent to which the architect imprints thereon his own ideas and his own methods. It would perhaps be an incomplete statement to say that the architect should never consider the client's wishes, for, quite aside from the commercial inadvisability of such a course, it very often happens that the restrictions under which the architects may most chafe are spurs in the side of his good intent, prompting him to do his best work; but certainly the architect who is conscientious, who wants to do the best possible thing, will have the largest measure of success if he always refuses to do or lend himself to anything which his trained artistic intelligence tells him is not right. That is to say, an architect, considering all the responsibilities which are thrust upon him, as well as those which he is glad to assume, must, if he is to succeed, be a man not only possessing the courage of his convictions, but possessed as well of very tangible convictions. With such a man, given the problems which come to the average practitioner, his opportunities and his influence in molding public taste, in fostering artistic thought, are very large. Indeed, this phase of architectural practise is the redeeming element which draws into the profession so many bright, capable minds. The pecuniary rewards of architecture are certainly not excessive. In most cases they are small, but the mental satisfaction of leadership, of guiding the taste of the community, is a recompense which atones for much of the lack of personal financial possibilities. This power of the architect, of course, works both ways; it is a responsibility which must be met.

WE can imagine no more disagreeable condition for an educated, conscientious man than to feel that a building which has been entrusted to him is beyond his reach; that he is out of his depth in a sea of artistic troubles, and that he cannot quite keep up with his responsibilities. It is bad enough when he has that uneasy feeling, which we all share at times, that he isn't quite doing his best, but when he tackles a job which he has to admit to himself he isn't able to solve, the very responsibilities which lend so much to the profession may at times become unbearable. Some one has said, not inaptly, that all humanity is divided into two classes, — one the vast majority, including those who are led, the other, the extremely small minority of those who lead, and that it belongs to every one to say in which category he shall be classed. The architect who is not a leader, who cannot take a position of influence, is in the wrong profession. He is in a calling that absolutely demands ideas, that obliges leadership, and if he cannot meet that demand, if the opportunities the profession gives him he is unable to respond to, the quicker he finds it out and turns his energy to something else, the less mortification he will have in comparing his work with those around him. The successful architect is always a leader, a molder of thought.

ALTHOUGH it is easy for the architect to arrogate to himself a high position in the creative art world, it must not be forgotten that a very large share of the success of any architectural work belongs to the silent workers who are able to carry out to at least relative perfection the ideas of the artist. Therein is the function of the trained mechanic, and the debt which architecture owes to some of our mechanics is a large one. Take the single department of terra-cotta; we have at different times illustrated in this journal some of the best of the modeled work which has been executed in various parts of the country, and the names of the architects have been quite

rightly associated with the buildings and with the work. The ideas were theirs, the design, the arrangement they could wholly claim; and yet we are supposing no lack of ability when we make the statement that it is doubtful if one architect in a hundred could actually model the terra-cotta which goes into his building, or be able to more than approximately indicate the style of detail in modeled work. It is not necessary that the architect should be a fine modeler, nor even a remarkable draughtsman. The drawings which Michael Angelo made for the dome of St. Peter's, measured by the work of some of our modern accomplished draughtsmen, are mere rude, illiterate scrawls, but the ideas are there. To execute the work, however, we must have trained mechanics, trained not only in manual dexterity, but in the appreciative artistic sentiment which will enable them to grasp the suggestion of the architect and carry it out in its full richness.

WITHOUT the help of the mechanic, the artisan, and the manufacturer, the art of the architect would avail him but little and his leadership would be barren of results. A large modern building represents an extent of cooperation which is almost inconceivable to one who has not been through it all; and while the inception is with the architect, and the merit of the work is measured by the correctness of his ideals, the actual building operation is a result of coordination of forces which the architect can only start in motion and guide in their course. And just as responsibility is measured in a certain sense by its limitations, so the responsibility of the modern architect becomes the greater because of the interdependence of the arts, sciences, and manufactures which enter into a modern structure; nor is the responsibility to the mechanics who put themselves under his direction by any means the least of the obligation which the architect has to assume.

CORRESPONDENCE.

FRESNO, CAL., Sept. 1, 1898.

EDITORS BRICKBUILDER: — In the April number of THE BRICKBUILDER, Professor Baker, in his interesting article on the "Strength of Brick Masonry," propounds this query: "Why did the pier fail in the larger portion under less than half the stress the smaller portion bore without any signs of failure?"

This peculiarity in the cracking of brick masonry is of frequent occurrence in building construction, and I think it can be scientifically explained.

We will assume in this case that the pressure was applied uniformly per square inch on the top of the pier by the plate covering its entire surface.

The lines of pressure would then be vertical, and save for the weight of the brick, the pressure would be uniform per square inch for any height of the pier, the section remaining uniform.

At the enlargement of the pier, the tendency would be for the pressure to distribute itself over the entire section. The amount of this pressure distributed outside of the vertical lines of the smaller top part of the pier would be upon the cumulative principle, similar to that which obtains in metal construction where stress is transferred to reinforcing plates through the rivets.

In the case of this pier, and all similar construction, the mortar joints directly under the initial lines of pressure become compressed, and the tendency to transmit a portion of this stress to the enlargement of the pier brings a tensile stress upon the under surface of the bricks due to flexure, which, I think, is the explanation of the rupture.

If Professor Baker will examine the brick buildings in his city, he will probably discover instances of this kind of failure. Where beams supporting heavy front walls are improperly placed upon the supporting piers or side walls cracking of this kind may be found.

Very respectfully yours,

A. C. SWARTZ.

THE writer's answer to the foregoing question, *i. e.*, the explanation of the cause of the failure, is found in the middle of the first paragraph at the top of the second column, on page 78, April number. It is as follows: "The failure is due to the compression of that portion of the bottom section directly under the top section, thereby causing the compressed portion to shear off from the uncompressed part of the base section."

Mr. Swartz's explanation does not differ materially in principle from the above, except that he directs attention to the bending that always accompanies shear. The writer believes that the phenomenon is more an example of shear than of bending. However, the knowledge of this method of failure of piers and its application in design is the important fact to be kept in mind.

IRA O. BAKER.

CHAMPAIGN, ILL., Sept. 15, 1898.

PERSONAL.

BROUSE & AREND, architects, of Trenton and Asbury Park, N. J., have opened an office at 931 Chestnut Street, Philadelphia, and would be pleased to receive samples and catalogues.

WALTER I. GIDEON, architect, has opened an office in the Sheppard Building, Springfield, Mo. Samples and catalogues desired.

ILLUSTRATED ADVERTISEMENTS.

IN their advertisement, page x, Fiske, Homes & Co. show another of their series of Brick and Terra-Cotta Fireplace Mantels.

A residence at Baltimore, Md., of which C. L. Carson is the architect, is shown in the advertisement of Harbison & Walker Company, page xv.

The White Building, Boylston Street, Boston, Winslow &



TYMPANUM IN DORMERS, PUBLIC SCHOOL, 108TH AND 109TH STREETS AND AMSTERDAM AVENUE, NEW YORK CITY.
Executed by the New York Architectural Terra-Cotta Company.
J. B. Snyder, Architect.

Wetherell, architects, is shown in the advertisement of the Boston Fire-proofing Company, page xxii.

In the advertisement of Henry Maurer & Son, page xxiii, there is illustrated a section of their new "Eureka" Floor Arch. This arch is especially designed for light fire-proof construction.

The Celadon Terra-Cotta Company, Limited, illustrate in their advertisement, page xxvii, four patterns of decorative roofing and siding tiles.

The American Schoolhouse. XI.

BY EDMUND M. WHEELWRIGHT.

IT goes without saying that every plumbing system should have a line of soil pipe of extra heavy cast-iron pipe, which has been subjected to the water test when in position, that this pipe should be

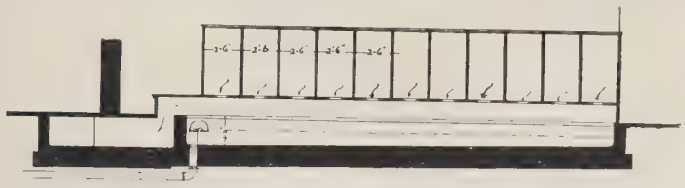


FIG. 1.

extended above the roof, and that, where the conditions admit, the house trap should be placed outside the building in a brick man hole of sufficient size to be of ready access.

In the installation of plumbing in any building, but especially in schoolhouses, the three things most essential for the fixtures themselves are, first, metal or submerged joints for all fixtures; second, in view of the usually poor janitor service, fixtures of types readily cleansed; and, most important of all, free and constant local ventilation of the fixtures.

No fixture should be used which has a putty, wax, or otherwise packed or gasketed joint, and in water-closets, if the trap is not of iron or brass, the joint between the trap and the soil pipe should be below the water line of the trap, so that if there is the slightest disconnection at the joint, as is liable through shrinkage, settlement, or violence, the dripping water will make the defect immediately noticeable.

When the janitor service is thoroughly efficient the question of possible external uncleanliness of soil-disposal fixtures is eliminated, and separate water-closets with strong local ventilation are preferable to latrines or ranges. Water-closets, however, involve greater first cost and are subject to danger of breakage. Given either a water-closet, brick latrine, or range, if arranged with strong and constant local ventilation, it is on the outside and not the inside of these fixtures that the conditions detrimental to health are generally to be found. The inner surfaces are constantly wet, and hence keep the germs out of the air; and these inner surfaces are, besides, subjected to cleansing currents of air constantly moving away from the inclosure. Outer surfaces become coated with dirt, which, as it dries, flakes off, and, becoming dust, is breathed in with the air. In the brick latrine the external surface is minimized, and if properly constructed can readily be cleaned both inside and out; in the intervals between the flushing the fœcal matter is submerged in water, and at a lower point than in the water-closet ranges. These latrines can be perfectly ventilated at a relatively slight cost. Figs. 1 and 2 show a readily cleansed form of brick latrine which has proved in use to be effective and unobjectionable.

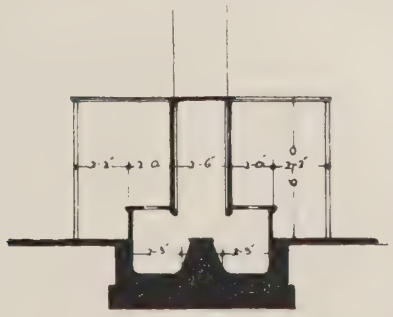


FIG. 2.

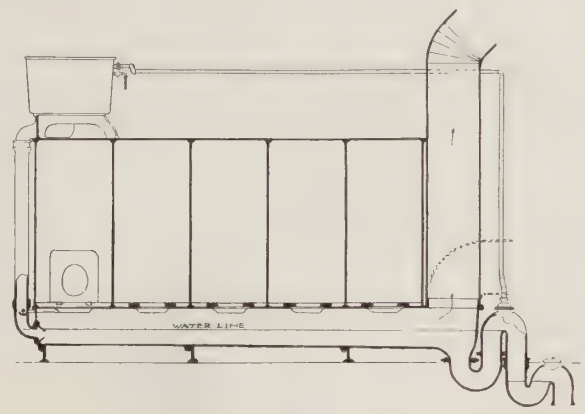


FIG. 3.

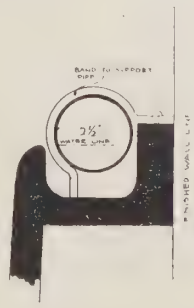


FIG. 5.

Brick latrines must, however, be constructed with great care, so that there shall be no possibility of the pollution, through leakage, of the ground below the basement floor; these latrines must be also connected with an ample vent shaft, which must be kept constantly heated summer and winter: and if given strong and constant ventilation, they may even suffer considerable neglect by the janitor without danger to health of the occupants of the building. In the construction of brick latrines, Portland cement only should be used; thoroughly plastered outside and in with Portland cement, with a final coat of neat cement smoothly hand floated, and covered from the air until it has set perfectly hard. The latrine seats are preferably made of iron, and where wood is used the under side of the woodwork should be lined with sheet lead. The seats should be self-closing. Latrines should have automatic flushing attachments arranged to flush every two or three minutes, and should be provided with a 3 or 4 in. stand-pipe, which should be removed just before recess, by the janitor, to give a thorough flushing and change of water.

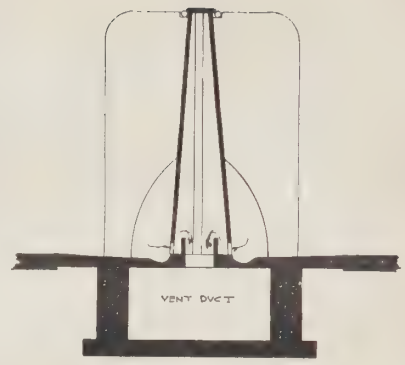


FIG. 4.

The water-closet ranges are arranged so that but little water stands in each section, and when flushed the trough is thoroughly cleansed. The outer surface is more easily kept clean than is that of an equal number of water-closets. Previous to 1895 such fixtures as were then on the market had no provision for local ventilation. Fig. 3 shows a water-closet range with an attachment suggested by Mr. Frederic Tudor which obviates thoroughly this advantage.

The so-called "dry systems" of soil disposal should not be used where there is a sewer system, and even where there is no sewer the use of such systems is not advisable. The soil, reduced as it is to powder by heat, is in a condition most menacing to health, and if the draught of the vent stack is at any time defective, as it may often be through the neglect of the janitor to maintain the heat in the stack, there is a reverse current. This powdered matter may pervade the building and spread contagion.

The privy vault is an expedient which is not to be considered. For a building without sewer connection, earth closets are most advisable. They should have thorough local ventilation and should be in a separate building, which should be heated.

Any system of soil disposal which has sewer connection may be placed in the basement of a building with perfect safety, providing a strong and constant ventilation is maintained through the fixtures themselves to a vent shaft carried above the roof. Such vent shafts should have at least 5 sq. ins. of cross-section area for each

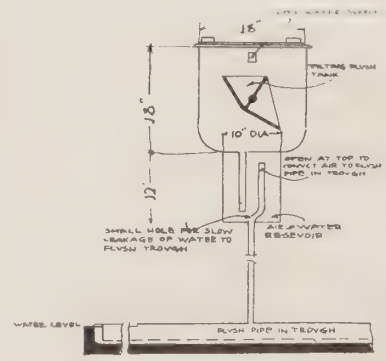


FIG. 6.

seat, and to insure a powerful aspiration at the least expense the boiler or furnace chimney may best be utilized. In this chimney the smoke flue of boiler iron will furnish all the necessary heat when the heating apparatus is running; and to provide for the periods when heating of the building is not required, a small stove or open hard coal grate should be placed at the base of the shaft. It should be made absolutely incumbent on the janitor to maintain this small fire when the heating apparatus is not being run.

In the opinion of Mr. Tudor, these stoves or grates should have a capacity of 20 sq. ins. for each schoolroom. There should be one water-closet for every fifteen girls and one for every twenty-five boys.

Urinal bowls require even more care in cleansing than do water-closets; indeed they require care that is not given by the average janitor, and must, therefore, for practical reasons be rejected in schoolhouse work, except in special cases: as, for instance, in some high schools, where usually a better class of janitors is employed than in the lower grades. A sloping slate slab provided with ample means of ventilation at the bottom, as shown in Fig. 4, and with an automatic flushing apparatus, as shown in Figs. 5 and 6, has proved to be suitable and cleanly. If it were certain that the whole of the fixture would be washed daily with hot water, the "dry system" of urinals is satisfactory, for there is not absolute need for water flushing of the slate while in use, providing the ventilation of the fixtures is strong and constant. The back slabs of slate urinal constructions should have a slope of 1 in 10 and the foot slab should incline inwards 1 in 20. All joints of the slate work must be waterproof.



PROPOSED HIGH SCHOOL BUILDING, MARLBORO, MASS.
Wheelwright & Haven, Architects.

To avoid the spread of skin diseases, set bowls should not be used in schoolrooms: sinks fitted with faucets or with a row of small nozzles should be provided.

For the same reason, where bathing facilities are given, set tubs or swimming tanks should not be used unless they are subjected to careful supervision by the master. Shower and needle baths are entirely unobjectionable.

If the best results are to be obtained in the heating and ventilating of schoolhouses, as indeed in any buildings where ventilation is an important consideration, it is requisite that the heat and air ducts should be planned when the building is first designed. It is not to be expected that an architect can be intimately conversant with a subject to which accomplished men are forced to devote all their energies if they are to master its difficulties. Few architects can therefore do their full duty if, without consultation with a heating engineer, they undertake to design a heating and ventilating system, unless it is such a one as has been almost exactly paralleled in a former building constructed by him with expert help, and even then the assistance of an expert is very requisite if the proper adjustment of the work and its best construction is to be assured. Except in rare cases, if the architect seeks without expert professional advice to select a system presented by a contractor in competition, it is almost certain that the result will be disappointing. If a client is unwilling to compensate the expert, the choice of a system by commercial competition is all he can fairly expect his architect to furnish. The architect should not certainly pay for such service, as it is rendered primarily for the client's benefit; and if the expert is competent, the expense of such service will be offset, if not by the first cost, certainly by the greater efficiency and practical economy of the plant above that usually furnished by the lowest commercial bidder upon plans and specifications prepared by that bidder.

The following notes in regard to the subject of heating and ventilation may prove of service in the preparation of plans: —

1. When a plenum fan is used 5-boiler horse power should be reckoned for each schoolroom or other room of equal size; an assembly hall to be reckoned as two schoolrooms.

For an indirect system of heating and ventilating a boiler capacity of 7 horse power per schoolroom is required.

2. The fan should not be relied upon to supply heat as well as fresh heated air; the building should be heated by direct radiation, and for ventilation fresh air heated to 70 degs. should be supplied by a plenum fan. This method is advisable in any school except the very smallest, and indeed in the schools of four or six rooms a gas engine may be advantageously used as a source of power, so that a definitely directed air supply may be had without requiring the services of a skilled engineer as janitor. In such cases, however, the janitor must have sufficient capacity and conscience to appreciate that the engine should be kept clean.

3. Another advantage of the use of direct radiation for heating is that the rooms may be quickly warmed. It is desirable, also, that the fan should be used in the early morning hours, but that the air should be drawn not from outdoors, but from the building itself. But when the building is occupied the air should be invariably taken from outside the building.

Where space for direct radiation is limited, as is usually the case in laboratories, the temperature of fresh-air supply may be increased to compensate for lack of direct heating by passing the air for the room through a supplementary heater at the base of the air duct for the room.

"Indirect heating," dependent as it is upon the direction and velocity of the wind, is less certain than the method of heating and ventilating advocated above, and it involves a greater combustion of fuel to procure the same results. This extra cost is largely due to the necessity of inducing the flow of air through the vents by means of steam coils. The percentage of the additional consumption of fuel required by heating by "indirect radiation" with heated vents above the cost of heating by direct radiation and with fresh heated air supplied by the fan is reckoned to be twenty-five to thirty-five per cent.

4. To thoroughly heat by direct radiation a room with a southerly or easterly exposure, 1 sq. ft. of radiating surface should be allowed for every 100 cu. ft. of the enclosure. For rooms with westerly and northerly exposures the heating surface should be 1 sq. ft. for every 70 cu. ft. of the enclosure.

5. In a schoolroom 28 by 32 ft. the air inlets and outlets for "indirect radiation" should be 4½ sq. ft. for the lower rooms, ranging up to 6 sq. ft. in the third story. Where plenum fan is used the air outlets remain as above, but the air inlets are reduced 25 to 30 per cent. Under ordinary conditions the architect may safely give the maximum areas to the flues, for the volume of air

which passes through can be regulated by dampers; and if on account of some constructional necessity he wishes to reduce their sizes in any particular case, he can get the advice of an expert. It should be borne in mind that the minimum advisable air capacity per pupil is 30 cu. ft. In assembly halls and other large rooms, or in rooms with but one outer wall, there should be two air outlets.

The best results are attained where air outlets are placed on inner walls only. Air inlets may be placed where most convenient. To avoid draughts, air inlets for schoolrooms and assembly halls should be placed with bottom of register face 7 ft. above the floor. In small rooms the air inlet may be near the floor. If properly protected from the lodgment of dirt, the most effective position of an air inlet is the floor.

Inlet and outlet ducts should be fitted with dampers, the former to be mixing dampers, so that the external air admitted to the room may have its temperature regulated at will. The air inlets should be fitted with deflectors, so that the air will be thrown towards the ceiling and be given proper diffusion. Air outlets should have openings for winter ventilation as close to the floor as possible, and for summer ventilation close to the ceiling. The summer opening for ventilation should be fitted with a register; that for winter ventilation requires a face only.

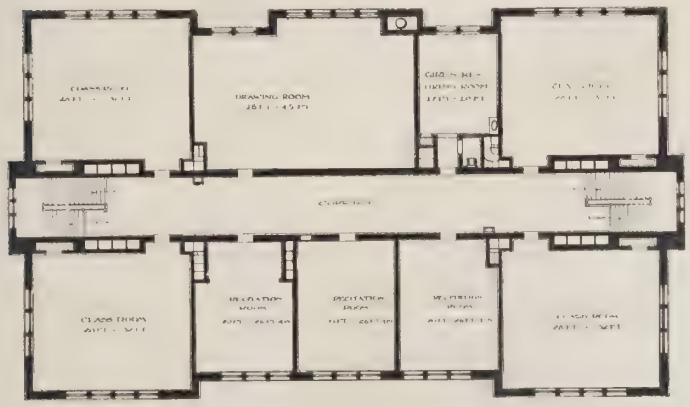
Unless a school is certainly to be blessed by the services of a thoroughly efficient and faithful janitor the heating system should be regulated by automatic control. No excuse should be afforded the teachers of cooling off the rooms by the opening of windows; in doing this the advantages of double windows are nullified, the heat is wasted, the flow of air through the designed channels is disturbed, and dangerous draughts are caused.

The ventilation of a schoolroom may be through its wardrobe. Heat is in this way given to the smaller room, a cleansing current of air passes through the clothing, and the possibility of air from the wardrobe finding its way to the schoolrooms is avoided.

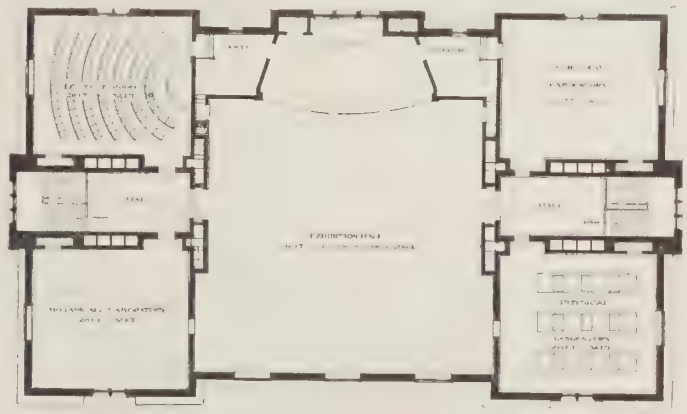
As noted in regard to plumbing, the soil-disposal fixtures and urinals should have strong local ventilation which should be adequate to insure a constant current of air through the toilet room to the aspirating shaft, so strong that by no peradventure the air of the toilet room shall pass into other portions of the building. In corridors the movement of air should be so arranged that it passes thence to the schoolrooms, and not *vice versa*.

It should be better recognized than it is by school committees, that upon the faithfulness and knowledge of the janitor depends to a great degree the health and comfort of the inmates of the school. Janitors are too often found to be either faithless or ignorant, or both, and consequently not only does unnecessary discomfort result, but waste of fuel, injury of apparatus and fixtures, and serious sickness and deaths. The writer knows of no city where an effective system of janitor control has been adopted, the only organization of the janitors being that made by themselves, which have not the object of self-improvement, but that of any like "political" organization. Twenty-five years ago Mr. Philbrick, Superintendent of Boston Public Schools, recommended that the janitor service of the schools of that city should be placed under the control of a chief who should have full power of appointment and removal. No steps have as yet been taken to this end.

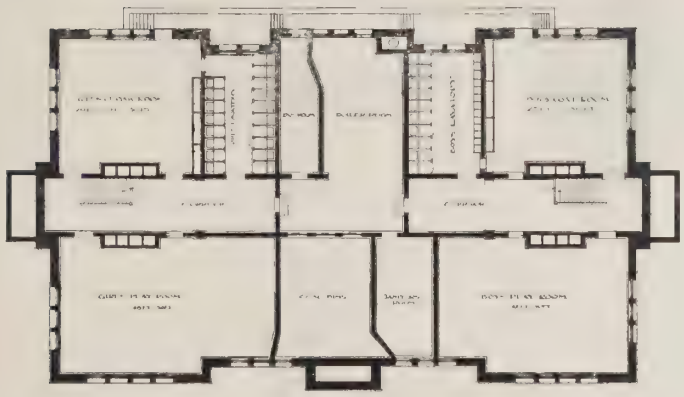
There should be certainly such direct executive control of janitors. At stated times, together with other duties, the janitors should be required to make record of the outside temperature as well as in all portions of the building, and they also should keep a record of the amount of coal consumed each day. They should be at any time subject to visits from their chief, and subject to his discipline without resource to the school committee.



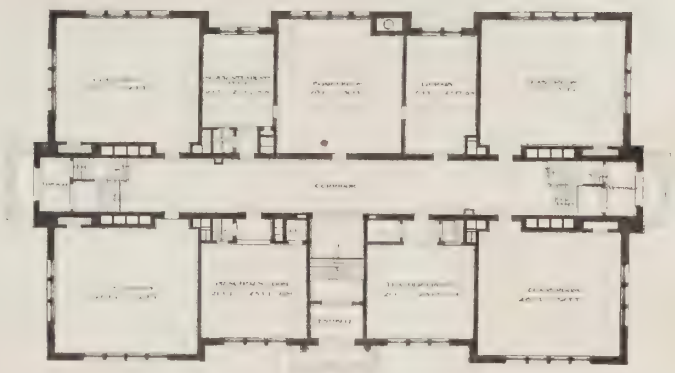
SECOND FLOOR.



THIRD FLOOR.



BASEMENT.



FIRST FLOOR.

PROPOSED HIGH SCHOOL BUILDING, MARLBORO, MASS.
Wheelwright & Haven, Architects.

Suburban Residence Built of Brick.

COST, TEN THOUSAND DOLLARS.

BY EDWARD B. GREEN.

IN preparing these sketches, the requirements of the program have been kept in mind, — the use of clay products; a home for a family of moderate means, of quiet and refined tastes, preferring a suburban to a city home; a lot 75 ft. wide, facing the south.

The requirements seem to limit the style of the exterior to the Italian or English Domestic, the latter style being adopted in these drawings.

The house facing south, two and a half stories in height, and the lot on which it is placed being lower by 10 ft. on the west side (the left-hand side facing the house) than on the east, the more effective approach is on the west or low side. This will give, as one enters the gate, a view of the lot unbroken and rising to the building, and a better effect can be gained of the lay-out and planting of shrubbery and trees. No effort has been made to lay out the grounds in a formal manner. The taste of most of us who wish to live in a suburban home is to "throw off our coats," so to speak, and be unconventional. An unbroken expanse of grass leading to hardy shrubbery and trees surrounding the house and lot lines, and the house itself well covered with vines — no unnecessary walks or roads, and these without curves — will make the most charming home scene to be imagined — no "fuss or feathers." A pool of water near the entrance — not a fountain — will, if rightly placed, add to the effect and quiet by reflecting the home and surroundings as one enters.



The main entrance of the house is approached by a series of wide and broad steps, built of hard, rough (paving) bricks, balustrade, a brick wall, and all more or less covered with vines and shrubs, leading onto the terrace, which may be paved with brick or gravel, but preferably covered with grass. The reflection of a pavement or floor would be disagreeable, and at times hot. At least some part of it should be of grass, — that part which shows from the windows, leaving sufficient amount of space to sit, to be paved. With a double awning of dark colors, to let down, the reflection will not be strong, and a most cozy place can be arranged.

The family, for general use, will find the side entrance more convenient; it is easily approached from the carriage road (a suburban home means a horse and depot wagon). On entering, one finds a side hall running widthwise of the house, between the kitchen wing and the main building, and ending in a large coat room under the landing of the stairs, also provided with a lavatory. This will be found most convenient for the rubbers and storm coats of the family. It will also prove a convenience for guests on rainy nights, and even on more formal occasions, as the side staircase can be used as the guests arrive and depart. It will be noticed that the door of this side entrance enters at the level of the ground, on the low side, so from the landing of the stairs it is but a few steps to descend to the level of the cellar floor, or but a few steps to the level of the main floor; it will, therefore, be convenient to put your "wheel" in the room provided for it under the dining room. This being well lighted, and 14 by 14 ft., can also be used as a shop for those members of the family — always to be found — who delight in tinkering and mechanical devices.

To the rear across the side hall is the kitchen portion. It is designed that this part of the house and the portion directly above it shall be devoted to the servants and their work, and both floors are carefully separated from the rest of the house, — the butler's pantry on the first floor, as well as the kitchen, is separated from the dining room by the width of this cross hall, — not sufficient space to cause any inconvenience in serving, yet so separating the "business end" of the house that odors or noise are not perceptible.

The kitchen, by some, might be considered small (10 by 14 ft.), but with large pantries, — the range placed in the corner out of the way, and provided with a large ventilating flue, — and with a servants' dining room (a necessity in suburban life), store room, and refrigerator room in such position as to be most convenient. It saves labor to have these things as small as practicable.

The servants' quarters, on the second floor of the kitchen por-

tion, include two servants' rooms, bath, house-maid's closet, and linen room.

It will be seen that advantage has been taken of the southern exposure. From the street this gives the house a broad appearance, but it is done with a view of getting the sun in every room, not to make the house look big.

The main entrance and enclosed porch of glass (which can be taken down in hot weather) leads into the hall; the south end, being cut off by pilasters and beams on the ceiling,— rather than doors,— forms a small reception room. The social life of the suburbanite being more informal than that in the city, a large reception room seems unnecessary. The most space and greatest effort should be devoted to the library, or living room — it should be *the* room of the house.

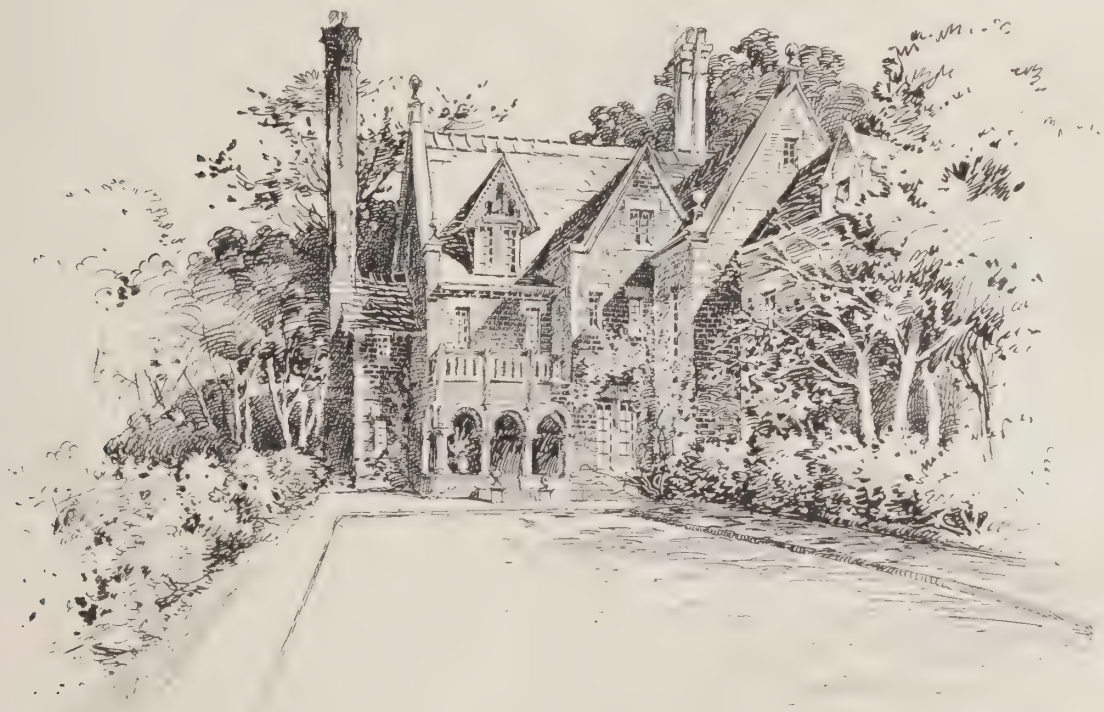
Next in importance to the living room is the dining room. Off from the library is a little "study" or "den," — a most useful room for a student, — or it is a room where the man of the house can retire to do thoughtful work, or smoke or grumble to his heart's content, or see a friend.

The inglenook fireplace at one end of the library is cozy and warm on a cold day. As people who love a wood fire want the least excuse to have one, it is therefore convenient to have it somewhat retired, so that it will not overheat the room in warm weather.

It will be noticed that the arrangement of the house has the advantage, on entering, of making the house appear large, the full length of the house being lengthwise of the living room and dining room, stairs at one end and reception room at the other end of the hall — the lines of the longest dimensions are shown.

The porch on the north side of the library is covered, and overlooks the court or private garden; this could be made large enough





for the tennis court. It is suggested that this court be surrounded by a pergola or a hedge 6 or 8 ft. high, shutting out the kitchen yard, to make an entirely private or enclosed space. It also makes a shady walk.

The dining room is designed to be a square room, in order to accommodate a round table. In a small house this is desirable, because it will always accommodate more guests than the same number of square feet in a narrow, long room, and yet not appear to be as crowded. The round table need not be changed in its dimensions, except for extraordinary occasions. An ordinary round table 4½ to 5 ft. in diameter does not seem too large for only two, and will conveniently seat six or even eight, if two or three are children. The dining room has a corner fireplace, and a sideboard built in, balancing the mantel.

The idea is to finish the library and hall in dark quartered oak; the dining room white, with mahogany furniture, tapestry walls, the library surrounded by low bookcases to form a wainscot, and, if a great number of books are to be accommodated, the cases should run to the ceiling; use the books as *the* feature.

The stairs, first and second floor, run up at the rear of the hall, with a large landing on the second floor. The guest room opens directly from this hall, and has its separate bath, corner fireplace in corresponding position to the fireplace in the dining room below.

The family rooms (three) are in a row, facing the south, and all opening onto a corridor, which corridor, in turn, by a sliding door, opens into the main hall. By this arrangement the family rooms are made a suite, which is cut off from the rest of the house. This separation of the family apartments gives additional privacy, and prevents the children from being disturbed by music or unusual noise from below; and, on the other hand, the children do not disturb those below. Each of these family rooms has a fireplace and one or more closets. From the family room on the southeast a

balcony opens to the north, which is most useful for airing clothing, and will be a cool retreat in hot weather.

Rooms could be finished as a trunk room, store rooms, and, perhaps, one or two small bedrooms in the attic.

In the cellar the usual things are provided for,—space for heating apparatus, store rooms, wine cellar, laundry, bicycle room, etc., etc.

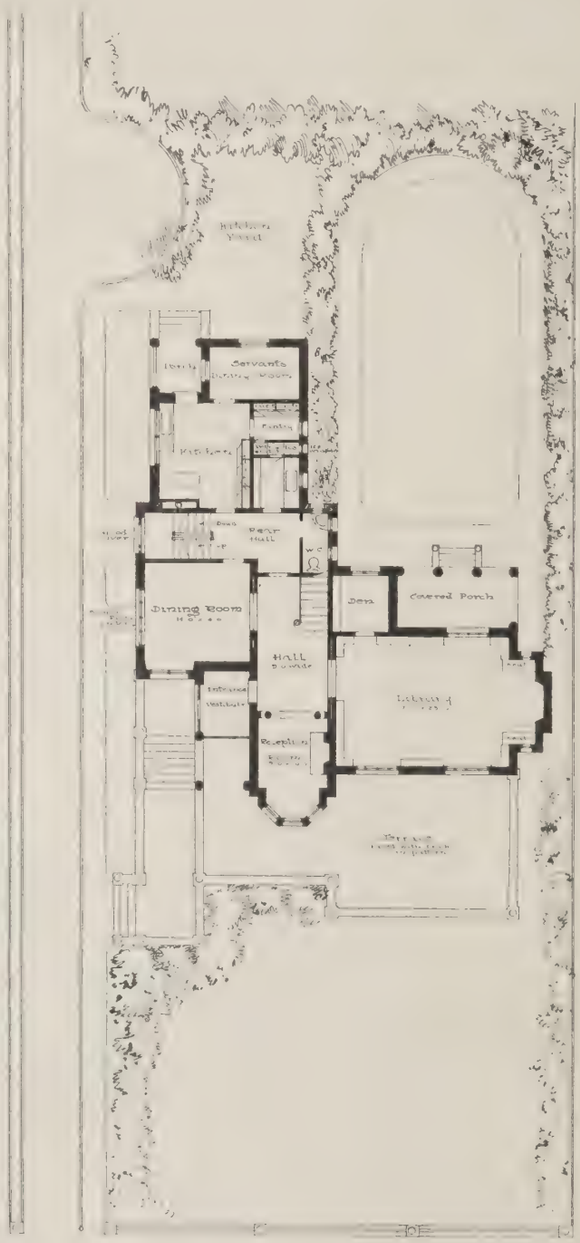
Materials: The house is designed to be built of rough common sand brick, hard burned, brown in color, preferably not of an even color, being darker at the bottom and growing lighter toward the top, the idea being to reproduce somewhat the exquisite colors of a meerschaum pipe,—rich browns, the brick to be selected from those that are nearest to the fire and being "fire marked." They are to be carefully laid up, with wide joint, joints "struck." The bricklayer can show a great deal of ingenuity and artistic feeling in bricking out the design, in the use of his colors. The mortar is to match as nearly as possible the color of the brick. All the moldings, string-courses, copings, sills, and mullions are to be of molded brick and terra-cotta, as the case may be, as indicated on the plans.

The house, if placed in among a number of large trees, to have a dark red tile roof; if standing pretty well in the open, a shade of green slightly glazed.

The exterior walls to be laid with a hollow space 2 ins. wide, the exterior course being tied to the interior wall with any of the patterns of metallic ties. This will give a thoroughly dry wall, and also do away with wood furring on the interior; or, a solid wall can



be built and furred on the interior with terra-cotta, or the ordinary brick furring, but a clear air space must be given between the furring and the wall, if it is desired to have a dry wall. The additional cost of making fire-proof floor partitions is little, probably in this scheme not over five or six hundred dollars. There are a great many methods that could be followed out, and which might give even more satisfactory results than the ones mentioned above. When the general public find that fire-proof work can be built for a very little additional price over the present work, and that the more it is used and the more accustomed the masons get to it the cheaper it can be done, its use will be greatly extended. The hall could be floored and the stairs built of brick or slabs partially glazed, the treads being of slabs of marble, balustrade of terra-cotta glazed; all the mantels and fireplaces to be of brick and terra-cotta, shelves or seats being glazed (this does not mean a high glaze). Cellar



walls to be built without the use of stone, over-burnt brick being used to the grade line. At this point a glazed course of terra-cotta or brick.

PROFESSIONAL ETHICS.

IF good professional ethics in relation to one another were the rule among architects, while the conditions of practise would be more conducive to doing good work, the total result in the distribution of employment would be much the same as if the "get there" idea were to prevail. Professional habits, as followed by those of the profession who have, as the French say, "arrived" are rather an index of how they achieved their position than, as is sometimes supposed by the irregulars, a creation to help them to keep it. The only way to permanent success is expertness, and this is to be attained not by working for work but by working at it.—*Canadian Architect.*

Balcony and Parapet Balustrading.

BY THOMAS CUSACK.

WHAT has been said in depreciation of sheet-metal cornices applies with equal force to the misuse of that material in balustrading. Many a creditable and, otherwise, well-executed design has been marred beyond redemption by a hollow pretense of make-believe balusters ranged along the parapet. It is, of course, customary to paint tin and galvanized iron affairs of this kind in simulation of the stone or terra-cotta used elsewhere on the building. Indeed, some of the most experienced artificers in this line go the length of sanding the receptive pigment, hoping to complete the deception. Viewed from afar, the counterfeit may pass as currency, but on closer acquaintance the hollowness and insincerity of the whole thing become painfully apparent. Not only is the building thus placed at a discount; the disillusion has a far-reaching suggestiveness in its bearing on things of real merit, detracting from their value in a, perhaps, disproportionate degree.

In situations where it may be expedient to obtain a desired effect on walls not calculated to carry much additional weight, copper becomes permissible — providing it be used frankly, and left to tell its own tale. At this point, however, a discriminating architect usually draws the line — unless overruled by a client in whom the penny-wise commercial instinct is paramount. In the latter case, all that may be said about consistency, homogeneity, or architectural continuity falls upon ears that hear not. To such a one an appeal, to be successful, must be made to his pocket, and in language with which he is familiar — the relative cost, for instance, is a turning point to which he will give due attention. The relative durability, and cost of maintenance, etc., are items that cannot be disregarded; for, even on his own ground, it is not the initial but the ultimate outlay that must be taken as a basis of comparison.

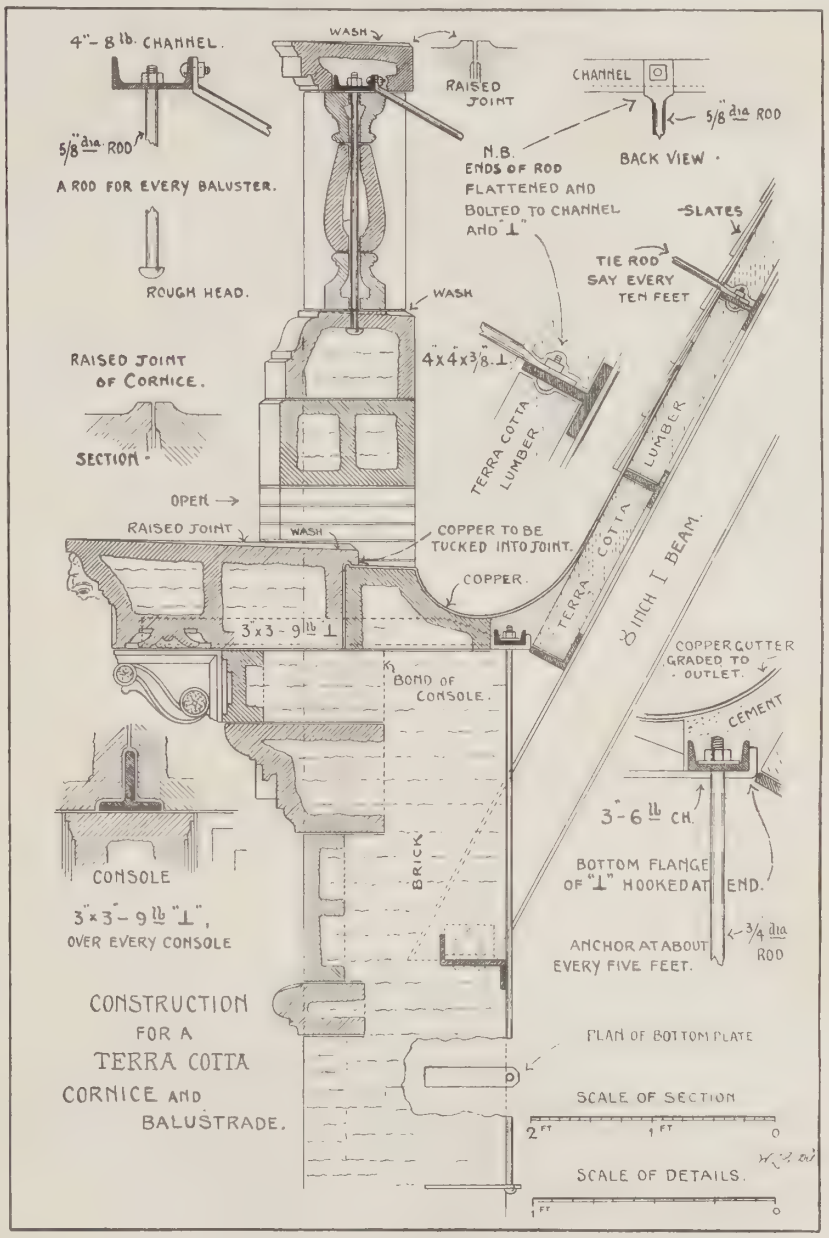


FIG. 62.

The cost of terra-cotta balustrading will depend largely upon the design, and the extent to which it is possible to render its execution simple and direct. A baluster of the shape shown at Fig. 62 should be jointed into three pieces. Not that it is by any means impossible to make such a baluster in a single piece, but, all things considered, it is not worth while to attempt it. To do so, two half balusters are pressed simultaneously, and the soft clay counterparts being brought into contact are united under pressure. When taken from the mold the seams are cleaned off, the imperfections filled in, and, to all appearance, the two are made one. Many of the unions so made are lasting, the two halves cleaving together under the most exacting conditions; but they are not all equally reliable. Some will show signs of dissolution after burning; others, that have passed through that ordeal apparently unscathed, may split from the effects of frost. Then, having to stand on end in the kiln, they are very liable to twist because of the extreme variation in sectional area. When this occurs the only remedy — one that may be resorted to in case of an emergency — is to cut the baluster horizontally, at suitable places, cementing the pieces together again on an iron core. It may as well be conceded that balusters made in one piece are subject to these defects, besides being more expensive in the first instance, with no compensating advantages.

A much better plan is to accept these adverse conditions, providing against the contingencies that arise from them by making the baluster in three pieces at the outset. This will allow each of them to be pressed into the mold from its widest end at one operation, therefore free from the vertical fissures incident to the method previously described. Our present illustration shows a ⅝ in. bolt passing up through the balusters, with head below and nut on top to hold the channel in position; also ⅝ in. staybolts to roof at intervals of 10 ft. Allowing for piers at angles, with intermediate dies in brick or terra-cotta placed at convenient intervals, the channel-bar would in itself afford sufficient lateral stiffness. The diagonal stays to roof being no longer necessary, would then be omitted altogether. We are, therefore, inclined to the opinion that some of the expedients introduced in this example err on the side of superfluous strength. A ½ in. rod as a core for the baluster, one end passing through a bar (or light channel), the other extending down into base in the form of a dowel, is usually sufficient without either head or nut. On this bar the coping is bedded down, and if the rebate in the ends be filled with cement, each piece locks itself and the adjoining pieces so securely that nothing further is required to hold them permanently.

A view of this particular cornice and parapet is given at Fig. 63, which is a residence at Madison Avenue and 39th Street, New York. The first story of the building is limestone, all above that point being terra-cotta and brick. In color the terra-cotta is an exact match for the stone, with brick walling of a somewhat darker

shade. This is a combination that has given much satisfaction here, and may be repeated elsewhere with equally happy results; which is more than can be said for some of the experimental "color schemes" with which we have been made acquainted. Instances of parapet balustrading constructed on the same general lines might be multiplied indefinitely. The present one, however, has been selected merely as a type of the class to which it belongs. Subject to the modifications suggested in the preceding paragraph, the construction does not differ greatly from current practise. Similar methods were adopted in nearly all of the balustrading with which we have been dealing of recent date, and from them there has not, as yet, been any reason to depart. It is likewise encouraging to note, in this connection, that the architectural idea has not succumbed to sordid commercialism, full justice being done to it in design, material, and workmanship. In these respects this building stands out in marked contrast with another corner residence not many blocks distant, in which a much more pretentious frontage is topped out with a painted imitation in sheet metal.



FIG. 63.

With a tier of balusters, a portion of which is shown at Fig. 64, the conditions differ materially from those of last example. They are less than a full circle on plan, with an ashlar engagement which, though usually made separate, may as well be attached. This admits of the two members being pressed at one operation, without horizontal joints, each block representing one baluster and one space. The vertical joint follows the contour of the baluster, and is therefore invisible when the work is assembled. In this method we have two distinct advantages; one contributing to better construction, the other, to a decided saving in the cost of production, and against which there is no offset whatever.



FIG. 64.

Pierced, double-faced balustrading such as shown at Fig. 40 (BRICKBUILDER, October, '97, p. 218), and again at Fig. 60 (BRICKBUILDER, July, '98, p. 143), though not free from inherent difficulty, can be made very successfully, provided the right methods are adopted. In the first place, it should not be cut up into small pieces, but made in sections, and they as large as are at all practicable. The number and location of the joints must depend somewhat on the ratio of voids, and also on the character of the design. In no case, however, should there be more joints than are absolutely necessary, and they should be placed so as to become inconspicuous when pointed. In pressing a piece of this description, a wood (or iron) core is embedded in each of the arms, and the clay built over on all sides of it. The hollow spaces remaining after these cores have been withdrawn allow the moisture to escape during drying, likewise the heat to pass clear through in burning. This makes it possible for the whole block to shrink uniformly, a precaution which goes far to prevent its cracking, or the undue twisting otherwise likely to ensue in the final stages of manufacture.

Some of the pieces in the parapet just referred to were as much as 3 ft. wide, all of them being 3 ft. 7 ins. high, and 8 ins. thick. At Fig. 60 they were 2 ft. 6 ins. each way, and only 5 ins. thick, yet in both instances the full complement was obtained, free from defects of any kind. Reasonable skill in the pressing, coupled with a little extra care in the succeeding stages, was enough to disprove the adverse dictum of certain wiseacres who, having failed themselves, were wont to decry less difficult undertakings as being wholly impracticable.

At Fig. 65 we have a section of balustrading recently made for the parapet of an important public building in which gray terra-cotta, in combination with brick of the same color, is used exclusively above grade level. This perforated panel is rather less than 4 ins. in thickness, a circumstance which adds considerably to the ordinary difficulties of manipulation. Yet more than seventy of these panels were produced without a single failure. The size is 2 ft. 6 ins. by 4 ft. 6 ins. with but one joint, which, passing through the hub vertically, becomes hardly noticeable when pointed.

The cross section of the arms was too small to admit of a core being inserted, as in previous examples; but a 1 in. hole should be bored through the diagonal members before the clay has lost too much of its plasticity. If pressed solid, and allowed to remain so, there will be a disposition to crack which can only be overcome by the exercise of extreme care in the drying. This is due to the difference in shrinkage between a relatively quick drying surface and a slow drying interior. To obviate this we must equalize the evaporation of moisture, and in that way render the shrinkage as nearly uniform as may be. The first expedient that suggests itself here is to ventilate the interior, and so accelerate the escape of moisture; the second, to cover up the exposed surface with damp cloths, or paper, to retard evap-

oration. In this way the natural tendency to crack, which if left to itself would prove fatal, has been controlled with gratifying success.

We have spoken of the drying as though it were a more delicate operation than that of the burning. In work of this kind, with refer-

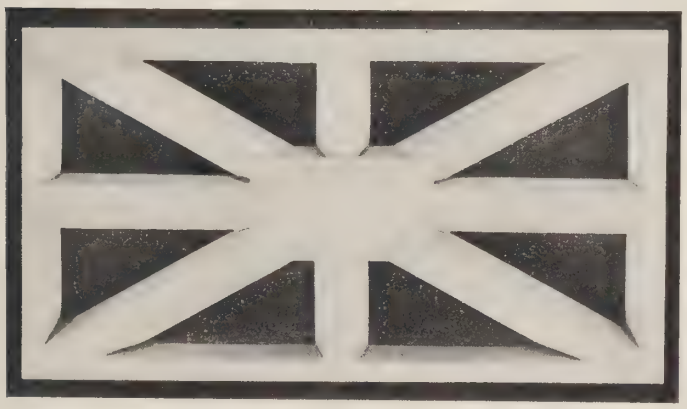


FIG. 65.

ence to freedom from cracking and warping, it certainly is so. Assuming that the chemical constituents of the clay are such as will give the requisite degree of tenacity, also that the clay has been sufficiently ground and pugged, thence delivered to the presser at a uniform consistency, the result then depends chiefly upon the condition in which the unburned pieces reach the kiln. If cracked or warped on going in, they will assuredly be in the same, or a worse, condition when coming out of the kiln; but if the foregoing conditions are favorable, and the pieces free from defects when placed on the bearings, the elements of uncertainty are largely eliminated. It was not always so, as we have good reason to know; but of late years successful firing has come to be looked upon as a matter of course in all well-regulated factories.

Most of the preceding remarks will apply to the panel shown at Fig. 66, the maximum size of which piece would depend somewhat



FIG. 66.

on its third dimension. With a thickness of, say, 6 ins., it would be quite practicable up to an approximate size of 3 ft. by 3 ft. 6 ins. In the hands of an architectural designer of average resource, single pieces of balustrading of these dimensions will, we think, be found equal to any possible requirement.

Tensile Tests of Cement.

(Concluded.)

BY IRA O. BAKER, PROFESSOR OF CIVIL ENGINEERING, UNIVERSITY OF ILLINOIS.

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Dry Mortar. As a rule, dry mortar is put into the mold by a machine, although it may be pounded in by hand.

The German standard rules are: "On a metal or thick glass plate five sheets of blotting-paper soaked in water are laid, and on these are placed five molds wetted with water. 250 grams (8.75 ozs.) of cement and 750 grams (26.25 ozs.) of standard sand are weighed, and thoroughly mixed dry in a vessel, then 100 cubic centimeters (100 grams or 35 ozs.) of fresh water are added, and the whole mass thoroughly mixed for five minutes. With the mortar so obtained the molds are at once filled with one filling, so high as to be rounded on top, the mortar being well pressed in. By means of an iron trowel 5 to 8 centimeters (1.96 to 3.14 ins.) wide, 35 centimeters (13.79 ins.) long, and weighing about 250 grams (8.75 ozs.), the projecting mortar is pounded, first gently and from the side, then harder into the molds, until the mortar grows elastic and water flushes to the surface. A pounding of at least one minute is absolutely essential. An additional filling and pounding in of the mortar is not admissible, since the test pieces of the same cement should have the same densities at the different testing stations. The mass projecting over the mold is now cut off with a knife, and the surface smoothed. The mold is carefully taken off and the test piece placed in a box lined with zinc, which is to be provided with a cover, to prevent a non-uniform drying of the test pieces at different temperatures. Twenty-four hours after being made, the test pieces are placed under water, and care must be taken that they remain under water during the whole period of hardening."

The French Commission recommend the following for sand mortars: "Sufficient mortar is gaged at once to make six briquettes, requiring 250 grams of cement and 750 grams of normal sand. The mold is then placed upon a metal plate, and upon top of it is fitted a guide having the same section as the mold, and a height of 125 millimeters (5 ins.). 180 grams of the mortar are introduced and roughly distributed in the mold and guide with a rod. By means of a metallic pestle weighing 1 kilogram, and having a base of the form of the briquette, but of slightly less dimensions, the mortar is pounded, softly at first, then stronger and stronger until a little water escapes under the bottom of the mold. The pestle and guide are then removed and the mortar cut off level with the top of the mold."

The Böhmé hammer apparatus is much used, particularly in Germany. It consists of an arrangement by which the mortar is compacted in the mold by a succession of blows from a hammer weighing 2 kilograms (2.2 lbs.) upon a plunger sliding in a guide placed upon top of the mold. The machine is arranged to lock after striking 150 blows. A high degree of density is thus produced, and more regular results are obtained than by hand. The apparatus is slow.

The Tetmajer apparatus is similar in character to the Böhmé hammer. "It consists of an iron rod carrying a weight upon its lower end, which is raised through a given height and dropped upon the mortar in the mold. The ram weighs 3 kilograms. This machine is used in the Zurich laboratory, and Professor Tetmajer regulates the number of blows by requiring a certain amount of work to be done upon a unit volume of mortar, — 0.3 kilogrammeter of work per gram of dry material of which the mortar is composed. This apparatus is subject to the same limitations in practise as the Böhmé hammer, in being very slow in use, and somewhat expensive in first cost."

STORING THE BRIQUETTES.

It is usual to store the briquettes under a damp cloth or in a moist chamber for twenty-four hours, and then immerse in water at a temperature of 60 to 65 degs. Fahr. For one-day tests, the briquettes are removed from the molds and immersed as soon as they

have begun to set. The volume of water should be at least four times the volume of the immersed briquettes, and the water should be renewed every seven days.

The briquettes should be labeled or numbered to preserve their identity. Neat cement briquettes may be stamped with steel dies, as may also sand briquettes, provided a thin layer of neat cement is spread over one end, in which to stamp the number.

AGE WHEN TESTED.

Since in many cases it is impracticable to extend the tests over a longer time, it has become customary to break the briquettes at one and seven days. This practise, together with a demand for high tensile strength, has led manufacturers to increase the proportion of lime in their cements to the highest possible limit, which brings them near the danger line of unsoundness. A high strength at one or seven days is usually followed by a decrease in strength at twenty-eight days. Steadily increasing strength at long periods is better proof of good quality than high results during the first few days. The German standard tests recognize only breaks at twenty-eight days. The French standard permits, for slow-setting cements, tests at seven and twenty-eight days, and three and six months, and one, two, etc., years; and for rapid-setting cements, from three to twenty-four hours for neat mortar, and twenty-four hours for sand mortars. In all cases the time is counted from the instant of adding the water when mixing the briquette. The briquettes should be tested as soon as taken from the water.

THE TESTING MACHINE.

There are two types in common use. In one, the weight is applied by a stream of shot which runs from a reservoir into a pail suspended at the end of the steelyard arm; when the briquette breaks the arm falls, automatically cutting off the flow of shot. In the other type, a heavy weight is slowly drawn along a graduated beam by a cord wound on a wheel turned by the operator. The first is made by Fairbanks Scale Company, and the second, by Riehle Bros., and also by Tinius Olsen, both of Philadelphia.

Fig. 2 represents a cement-testing machine which can be made by an ordinary mechanic at an expense of only a few dollars.

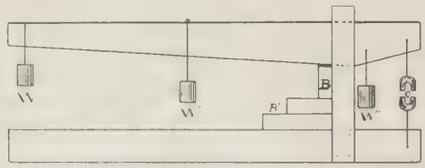


FIG. 2. HOME-MADE CEMENT TESTING MACHINE.
W = fixed weight. W′ = rolling weight. W″ = counterpoise.
B = block for shearing. B′ = block for crushing. C = tension clips.

Although it does not have the conveniences and is not as accurate as the more elaborate machines, it is valuable where the quantity of work will not warrant a more expensive one, and in many cases is amply sufficient. It was devised by F. W. Bruce for use on United States government work at Fort Marion, St. Augustine, Fla.

The machine consists essentially of a counterpoised wooden lever 10 ft. long, working on a horizontal pin between two broad uprights 20 ins. from one end. Along the top of the long arm runs a grooved wheel carrying a weight. The distances from the fulcrum in feet and inches are marked on the surface of the lever. The clamp for holding the briquette for tensile tests is suspended from the short arm, 18 ins. from the fulcrum. Pressure for shearing and compressive stresses is communicated through a loose upright, set under the long arm at any desired distance (generally 6 or 12 ins.) from the fulcrum. The lower clip for tensile strains is fastened to the bed-plate. On this plate the cube to be crushed rests between blocks of wood, and to it is fastened an upright with a square mortise at the proper height for blocks to be sheared. The rail on which the wheel runs is a piece of light T-iron fastened on top of the lever. The pin is iron, and the pinholes are reinforced by iron washers. The clamps are wood, and are fastened by clevis joints to the lever arm and bed-plate respectively. When great stresses are desired, extra weights are hung on the end of the long arm. Pressures of 3,000 lbs. have been developed with this machine.

For detail drawings of a more elaborate home-made cement-testing machine, see *Proceedings Civil Engineers' Club of Philadelphia*, Vol. V., p. 194, or *Engineering News*, Vol. XV., p. 310.

The Clips. The most important part of the testing machine is the clips by means of which the stress is applied to the briquette. (1) The form must be such as to grasp the briquette on four symmetrical surfaces. (2) The surface of contact must be large enough to prevent the briquette from being crushed between the points of contact. (3) The clip must turn without appreciable friction when under stress. (4) The clip must not spread appreciably while subject to the maximum load.

The form of clip recommended by the Committee of the American Society of Civil Engineers is shown in Fig. 3. This form is not entirely satisfactory, since it does not offer sufficient bearing surface, and the briquette is frequently crushed at the point of contact. The difficulty is remedied somewhat by the use of rubber-tipped clips.

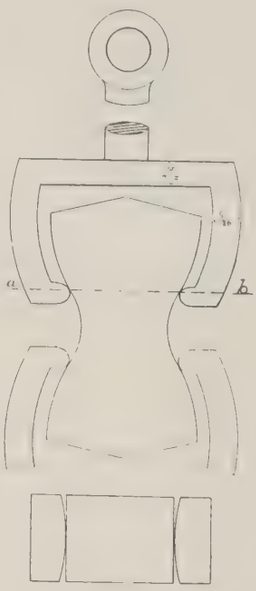


FIG. 3. AMERICAN TENSION CLIPS.

The clips and the molds to fit should be purchased of the regular manufacturers, as home-made ones will not give at all satisfactory results.

Whatever the form of the machine or clips, great care should be taken to center the briquette in the machine.

The Speed. The rate at which the stress is applied makes a material difference in the strength. The following data are given by H. Faija, an English authority, as showing the effect of a variation in the speed of applying the stress: —

Rate.	Tensile Strength.
100 pounds in 120 seconds	400 pounds.
100 " " 60 "	415 "
100 " " 30 "	430 "
100 " " 15 "	450 "
100 " " 1 second	493 "

Other experimenters do not get as great differences as above, but all agree that the apparent strength is greater the more rapidly the load is applied.

The French Commission recommends 660 lbs. per minute. The American Society of Civil Engineers recommends 400 lbs. per minute for strong mixtures, and half this speed for weak mixtures. The Canadian Society of Civil Engineers recommends 200 lbs. per minute. The German standard requires "13 lbs. per minute," which refers to the load applied at the end of the steel yard arm and not to the stress on the briquette. Apparently the multiplication of the German machine is thirty, and consequently the rate of stress is 13 x 30 = 390 lbs. per minute.

DATA ON TENSILE STRENGTH.

Owing to the great variation in the manner of making the tests, it is not possible to give any very valuable data on the strength that good cement should show. In 1885 a Committee of the American Society of Civil Engineers recommended the values given in Table I. At least the minimum values there given are required in ordinary specifications, and the maximum values are sometimes employed. Many of the better cements commonly give results above the maximum values in Table I.

TABLE I.

TENSILE STRENGTH OF CEMENT MORTARS.

Age of Mortar When Tested.	Average Tensile Strength in Pounds per Square Inch.			
	Portland.		Natural.	
CLEAR CEMENT.	Min.	Max.	Min.	Max.
1 day—1 hour, or until set, in air, the remainder of the time in water	100	140	40	80
1 week—1 day in air, the remainder of the time in water	250	550	60	100
4 weeks—1 day in air, the remainder of the time in water	350	700	100	150
1 year—1 day in air, the remainder of the time in water	450	800	300	400
1 PART CEMENT TO 1 PART SAND.				
1 week—1 day in air, the remainder of the time in water	...	...	30	50
4 weeks—1 day in air, the remainder of the time in water	...	. .	50	80
1 year—1 day in air, the remainder of the time in water	...	...	200	300
1 PART CEMENT TO 3 PARTS SAND.				
1 week—1 day in air, the remainder of the time in water	80	125	...	...
4 weeks—1 day in air, the remainder of the time in water	100	200	...	...
1 year—1 day in air, the remainder of the time in water	200	350	...	...

Natural cement, neat plastic mortar, will generally show 50 to 75 lbs. per square inch in seven days, and 100 to 200 lbs. in twenty-eight days. Good Portland cement, neat plastic mortar, will show 100 to 200 lbs. per square inch in one day, 400 to 600 in seven days, and 600 to 800 in twenty-eight days. With 3 parts sand, Portland cement, plastic mortar, will give at least 100 lbs. per square inch in seven days, and 200 in twenty-eight days. Of course the strength varies greatly with the method of testing. In consulting authorities on this subject, it should be borne in mind that the strength of cement, particularly Portland, has greatly increased in the past ten years. The specifications should be drawn to correspond with the personal equation of the one who is to test the cement.

The German standard requirement for dry mortar pounded into the molds is 227 lbs. per square inch at twenty-eight days.

EQUATING THE RESULTS.

It not infrequently occurs that several samples of cement are submitted, and it is required to determine which is the most economical. If the cement is tested with the proportion of sand usually employed in practise, then only strength and cost need to be considered; but if the cement is tested neat, then cost, strength, and fineness must be taken into account. Table II. shows the method of deducing the relative economy when the cement is tested with sand. The data are from actual practise. In a similar manner, results could be deduced for the relative economy at any other age. The circumstances under which the cement is to be used should determine the age for which the comparison should be made.

TABLE II.

RELATIVE ECONOMY OF CEMENTS TESTED WITH SAND AT 7 DAYS.

Cements.	Tensile Strength, 1 C. to 3 S.		Cheapness.		Relative Economy.	
	Pounds per Square Inch.	Relative.	Cost per Barrel.	Relative.	Product of Relative Strength and Relative Cost.	Rank.
A	168	95.4	$2.30	100.0	95.40	2
B	176	100 0	2.34	98.3	98.30	1
C	166	94.3	2 40	95.8	90.33	3
D	135	76.7	2 45	93.8	71.94	4
E	135	76.7	2.47	93.1	71.40	5

However, this principle should be employed with caution, particularly with short-time tests, since the method gives the advantage to a cement which gains its strength rapidly and which may therefore be unsound. If this method is employed, care should be taken that the minimum strength specified is not unduly low.

Fire-proofing.

A CONSENSUS OF OPINION AMONG LEADING ARCHITECTS OF CHICAGO ON THE USE OF BURNED CLAY FOR FIRE-PROOF BUILDINGS.

(*Concluded.*)

IN the last issue of THE BRICKBUILDER we published the results of interviews with some of the leading Chicago architects in regard to the use of burnt clay for fire-proofing purposes. Reports of further interviews are published herewith. In order to bring again before our readers the distinct lines upon which the inquiries were based, we reprint the questions to which reference is made in the interviews. These questions cover the whole field of our proposed inquiry, and a comparison of the replies suggested thereby shows how firm is the belief in burnt clay as a medium for fire-proof construction and how thoroughly this material has been able to accomplish the desired results. These interviews, as compared with the opinions we published some time since of some of our leading Eastern architects, show that the use and appreciation of terra-cotta does not materially differ in the West from what is recognized as the best practise in the East.—ED.

The following questions were submitted to those whose names appear hereafter: —

1. Do you employ burned clay in fire-proof buildings, and if so to what extent?

2. Do you prefer it to other so-called fire-proofing systems, and if so for what reasons?

3. What kind of burned-clay material do you prefer? or would you employ different kinds for different purposes?

4. Have the recent attacks on the burned-clay systems of fire-proofing by promoters of other systems influenced your judgment?

5. Do you think that the makers of burned-clay fire-proofing are trying to improve and perfect their material and its method of application?

6. What do you think is the lesson to be learned from recent fires in buildings fire-proofed with burned clay?

7. Do you think it right for architects to consent to their clients always taking the lowest bid for this kind of work without regard to the differences in what the parties intend to furnish?

8. What do you think is the reason why the price and quality of burned-clay fire-proofing have been reduced during the last ten years?

9. Do you agree with the opinions given by Mr. Jenney in the July BRICKBUILDER?

10. Do you think it desirable for architects to employ fire-proofing experts to design the details of fire-proof work and supervise its erection, as is now done in the case of steel constructions?

Louis H. Sullivan, formerly of the firm of Adler & Sullivan, has had a large experience in the erection of fire-proof buildings, not only in Chicago, but in St. Louis, Buffalo, New York, and other cities. He said: "Yes, I have used burned clay largely, and in nearly all of the fire-proof buildings that I have designed. I prefer it to other so-called fire-proof materials, because it is, on the whole, better adapted to the contingencies of building construction. It is best adapted to winter building and rapid work; in fact it is unwise to employ plastic methods for large buildings, even though it is proposed to do this part of the work in summer, for contingencies might arise to compel part of it to be done in freezing weather, when no dependence could be placed upon the results. The use of plasters and concretes in solid bodies demands practically laboratory conditions and constant inspection, and further, it is for these reasons also that I agree with Mr. Jenney that it is best for filling over flat arches to use as little concrete and as much tile as possible, and, when concrete is necessary, to make it as he suggests. I prefer porous to hard tile, but I would prefer a semi-porous tile to either, if I could get it, because it has great strength and is less liable than hard tile to

crack when suddenly cooled by water. I wish some manufacturer would put such a material on the market in this city. I have heard of its having being used elsewhere."

In answer to the fourth question, Mr. Sullivan said emphatically "No," which requires no enlargement or explanation of his views on that subject. In answer to question five he said: "In the West, that is including Buffalo and Pittsburgh and points west of those, yes; east of those points, no. The Eastern tile seems to be the same that it was years ago, very rough and uneven, both in form and quality. I very much dislike the Eastern system of making a soffit tile out of an extension of the skew-back carried under the beam on both sides. In recent work done under my direction in New York, many of these extensions were broken off in setting. They did not fully cover the space under the beams, and I required the contractors to use mortar combined with a reinforcement of metal buried within it, to supply the deficiency. But I do not like this as well as the independent soffit tile with an air space." Referring to Mr. Jenney's girder system as used in the extension to the New York Life Building at Chicago, and illustrated in the July BRICKBUILDER, he said: "I like it. It is a very simple and strong system of construction so far as the steel is concerned, and capable of thorough fire-proofing, so as to make flat ceilings throughout without disclosing the girders." In answer to the question, "What do you think is the lesson to be learned from recent fires in Pittsburgh, where the steel structure was saved though the fire-proofing was considerably damaged?" he said that the work was imperfect, but could, with slight improvement, have been made thoroughly reliable. "The lesson is that all fire-proofing is worthless unless thoroughly done."

In answer to question seven he said: "That is a good question that applies to everything, no matter what it is. I cannot control the commercial instincts of my clients, but try to do it."

In answer to question eight, he thought that the price and quality of burned-clay fire-proofing had been reduced during the last few years, because of the stringency of the money market and severe competition for contracts. As to whether or not he agreed with the opinions given by Mr. Jenney in the July BRICKBUILDER, he said: "In the main I do, yes." Mr. Sullivan is preparing to finish all the columns in a large store he is now designing for Chicago, to a round section, and to avoid sharp angles wherever possible.

During the absence of Henry Ives Cobb, in Washington, Christian A. Eckstorm, the manager of his offices, consented to give his own views, which he thought would reflect those of Mr. Cobb. In answer to the first question he said: "Entirely; except in one building now being erected (one of the Chicago University buildings), where we are using Makolite lintels between the floor beams in place of flat arches, but this has been done entirely for economic reasons, and not because we preferred them.

To question two he said, evidently referring to interior work: "Yes; and for one reason, that less depends upon the character of workmanship in putting up. That is not to say that we admit inferior work, if we can help it, but with setting hollow-tile fire-proofing the chances of getting inferior workmanship are less than with other materials and methods. For instance, in winter work and rapid construction the advantages are all with hollow tile.

In answer to question three he said: "We have used the hard-burned tile in all but two buildings. We used porous tile in the Chicago Athletic Club, which you know was severely tested by fire during construction, and when the protecting material was not in sufficiently complete condition to do its work as effectively as if the building had been finished, and also in the Chemical Building in St. Louis. That used in the latter was made at St. Louis. It was of about the same consistency as the Chicago porous tile, but the pieces had thicker webs than the Chicago make. I tried the heat and water test on it with satisfactory results."

To question four his answer was "No." To question five he said: "Not within the last three or four years. The Pioneer Fire-proof Construction Company, of Chicago, are now proposing to furnish hollow-tile lintels for floor construction to reach from beam to beam, in place of end-pressure arches, which will do away with the expense of centering, and I think it may reduce the cost of setting, though perhaps the tile may cost more."

In answer to question six he said: "I can speak only from our own experience. After the fire which attacked the Chicago Athletic Club, before completion, which was the only actual test ever given to any of our buildings, we removed some pieces of steel which seemed to have been most exposed to fire and had them tested exactly the same as new steel, and found that they had not been depreciated in any respect."

To question seven he said: "No. It is against the practise of this office to let work to the lowest bidder regardless of difference of material offered." He thought that competition and the stringency in the money market were the reasons why the price and quality of burned-clay fire-proofing had been reduced during the last ten years, and added, "It must be admitted that too many people are unwilling to pay for a good article when they can get a cheaper one which seems to answer the purpose." He had not sufficiently examined Mr. Jenney's article to give a definite answer, but in answer to question ten said: "Yes, it would be desirable for architects to employ fire-proofing experts, as is now done in the case of steel constructions."

N. Clifford Ricker, head professor of the Department of Architecture in the University of Illinois, and Dean of the Engineering Faculty, while not a Chicago architect, has always been in practise, and has not only had experience in the use of fire-proof materials, but has been a keen observer of the works of others, so that their experience has had an influence in shaping the course of instruction in practical construction at the University. THE BRICKBUILDER is glad to be able to add the expression of his analytical judgment to the opinions of more active practitioners. Taking the questions *seriatim* for his text, he said: —

"1. Since nearly all my buildings have not been required to be fire-proof, I have seldom had occasion to employ burned clay for fire-proofing.

"2. I certainly consider hollow burned-clay tiles for floors, partitions, and external walls to be more durable than any other fire-proofing materials for these purposes. With proper supervision and careful construction, the safe strength of floors may be computed with greater certainty; burned clay resists water, fire, and dampness more efficiently than any other system with which I am acquainted. The expanded-metal-concrete system was employed in the Library Building of the University because somewhat cheaper, thus obviating the necessity of reducing the size of the building.

"3. I should prefer to use fire-clay products for fire-proofing, though porous terra-cotta might be as efficient, though weaker.

"4. Not at all.

"5. This is doubtless the case, and would be the natural result of experience and competition.

"6. That this is the most efficient fire-proofing material used, if buildings are properly designed, so long as it is impossible to construct them entirely of brick masonry.

"7. No more than for any other kind of work. The advice of the architect to his client should be based on the greatest permanent or ultimate benefit to him.

"8. Results of experience, discoveries of new deposits of materials and new processes of manufacture, increased product, economies in management, competition in manufacturing and application, invention of new forms of finished products.

"9. Generally, although it is probable that failure of burned-clay fire-proofing to resist fire and water is due more to defective fixing and attachment, than to quality of material. It will not always be true economy to drop ceiling to bottom of girder, except perhaps in large rooms. Cinder concrete is lighter and cheaper, but is inferior to concrete of cement, sand, and gravel. No doubt plastering may still be greatly improved and made to resist fire and water without material injury.

"10. This will doubtless become necessary in case of a very important structure."

Masons' Department.

ESTIMATING BRICKWORK.

(*Concluded.*)

BY F. E. KIDDER.

IN any system or method of estimating there is necessarily a certain amount of guess-work involved as to the labor that will be required, and to some extent in regard to the materials, and the ideal system is that which most nearly eliminates this feature. In figuring by the method explained in the previous article, the contractor must, to a greater or less degree, guess at the price per thousand wall measure to use as a basis in making up his bid. True, if he has built similar buildings in the same locality and kept an accurate account of the cost, he can come very close in his guessing, but when the building has an unusual amount of openings, or has towers, or an elaborate brick cornice, or other special features, this method of estimating involves a good deal of guess-work. Again, a rise in price of one or more of the materials required, or in wages, will affect the rate per thousand, but not in the proportion that it bears to the article affected. To figure a job close, therefore, the writer is of the opinion that the quantities of all of the materials required should be estimated, and then the cost of the different items, including labor.

If part of the work is more difficult than another part, the labor on the two parts may be figured separately. The actual cost of the materials can be pretty closely estimated, the labor being the most variable item.

To separate the different items takes a little more time, it is true, than the method of figuring by the thousand, and requires more data, but one cannot expect to make a success of any business without putting a good deal of intelligence into it. The writer believes that one reason why the average contractor does not succeed better is that he is so careless in keeping accounts of the cost of the work that he does and the quantities of materials used.

Ask half a dozen brick contractors how much lime and sand it takes to lay 1,000 common bricks, and nearly as many different answers will be received, and few contractors can tell just what it cost per thousand to lay the bricks in any particular building. All of these points should be carefully determined at the end of every job, and the results itemized and recorded for future use. This will not only enable the contractor to figure more closely, but may enable him to discover leaks in his business.

The following data relating to a building built about a year ago, in Denver, was obtained from the contractor and is given to illustrate the way in which some of the items may be determined, although the relative amount of labor, lime, and sand for the pressed bricks was not kept separately on this job. The building was an ordinary two-story brick residence, 29 by 48 ft., with stone foundation walls and faced with pressed brick on all four sides; the walls were 12 ins. thick from foundation to wall plate.

Several contractors figured on the job, and their estimates varied but little from 93,000 brick, solid wall measure. There were 2,900 superficial feet of pressed brickwork, after deducting openings.

The writer figures that there are 2,426 cu. ft. of common brickwork, after deducting for all openings, and allowing nothing for the chimneys above the roof, as they were built of pressed bricks. There was no fancy brickwork.

The materials actually used in this building, and their cost, are as follows:—

18,300 pressed bricks, at $14.25, delivered	$260.75
42,000 common bricks, at 4.00, „	168.00
75 bushels of lime, at 46 cts.	34.50
21 loads of sand (about 1½ yards to load), at 60 cts.	12.60
2 bbls. mineral red (for red mortar)	10.00
Labor	202.50
	$688.35

This job, therefore, ran at the rate of 6⅔ pressed bricks to the square foot, after deducting openings, and the total number of bricks was a little less than two thirds of the wall measure.

It also took 17.3 common bricks to the cubic foot of actual brickwork.

Estimating as closely as possible the cost of the pressed bricks and the materials and labor required for laying them, and deducting from the total cost, we find that the 42,000 common bricks cost $315.18 laid in the wall, or $7.50 per thousand; the lime, sand, and labor costing $3.50 per thousand. Or, deducting the actual cost of the pressed bricks, without laying, and dividing by 93,000, we find that the work was done for $4.60 per thousand, wall measure. The wages paid on this job were $2.50 per day of eight hours, for bricklayers, and $2 per day for laborers. The masons lay the pressed bricks from the inside, and each man always backs up his pressed brick. The cost of laying the pressed brick, including lime and sand, was $6.15 per thousand.

The prices quoted above are extremely low, and probably cannot be duplicated elsewhere, but the quantities should run about the same in all localities.

For estimating brickwork in Denver, the writer finds that the following data is quite close for the average job:—

Pressed brick per net square foot, 6⅔.

Actual bricks required (pressed and common) two thirds wall measure.

Actual number of bricks to the cubic foot of common brickwork, after deducting openings, and calling a 13 in. wall 12 ins. thick, 17⅔.

A brick mason will lay 800 pressed bricks, or from 1,500 to 1,600 common bricks, on an average in a day of twelve hours.

To lay 1,000 common bricks (kiln count) requires 1½ bushels of white lime (80 lbs. to the bushel, or 2½ bushels to the barrel), and ⅝ yard of sand.

To lay 1,000 pressed bricks will require ¾ bushel of lime and ¼ yard of sand; and if colored mortar is used, about 50 cts. per thousand should be allowed for the coloring matter.

With wages at $3 per day for masons, and $2 per day for labor, the cost of labor per thousand bricks will be about $6.25 for pressed bricks and $3.33⅓ for common bricks.

Taking these figures as a basis, then, the writer would figure a job of brickwork as follows:—

2,493 sq. ft. (net) pressed brick at 6⅔ = 15,789 pressed bricks.

1,945 cu. ft. of common brickwork at 17⅔ bricks per ft. = 34,360.

15,800 pressed bricks at $15 per thousand, delivered	= $237.00
34,400 common bricks at $4.50 per thousand, delivered	= 154.80
Lime for 15,800 pressed bricks, 12 bushels.	
„ 34,400 common bricks, 51½ „	
63½ bushels at 46 cts.	= 29.21
Sand for 15,800 pressed bricks, 4 yards.	
„ 34,400 common bricks, 21½ „	
25½ yards at 55 cts.	= 14.02
Mortar color, 15,800 bricks, at 50 cts. per thousand	7.90
Labor, 15,800 pressed bricks, at $6.25	98.75
„ 34,400 common bricks, at $3.33⅓	114.66
Extra for laying 2,000 bricks in cornice	8.00
200 molded bricks, at 4 cts.	8.00
3 iron ash doors, at $1.75	5.25
Thimbles	1.00
Flue lining, 32 ft. at 25 cts.	8.00
Cleaning down and pointing	25.00
Total	$711.59
Add for profit and contingencies	70.00
Amount of bid	$781.59

As prices and methods of working vary in different localities, the contractor must, of course, determine the various prices for the different items, for himself, and when each job is completed, he should sum up from his bills and time-book the actual materials used and the cost of labor, and compare with his bid, and in a short time he can estimate very closely indeed.

Many Denver contractors now estimate in this way, except that they determine the number of common bricks by first computing the solid wall measure, and taking a certain proportion of this for the actual number of both common and pressed bricks. Thus, if the job figured, say, 72,000 brick wall measure, they would allow about one third, or 24,000 bricks for openings, and difference between 22½ and 17⅔, which would leave 48,000 bricks, kiln count. Subtracting from this the pressed bricks gives the number of common bricks. Having determined the number of bricks, the bid is made up in the foregoing manner. There is an advantage in this method, that the contractor knows just about what he has got to pay for materials where he is doing part of the work himself.

The writer would suggest that contractors might help each other by furnishing for publication in this column data along the lines above indicated, taken from their accounts. Such data would certainly be interesting to all and of great value.

MIXING CONCRETE BY GRAVITATION.

CONCRETE has generally been mixed in two ways, either by hand with a shovel or by steam machine mixers. The advantages of the different ways of mixing concrete are too well known to be spoken of here but briefly. The three principal advantages of mixing concrete with steam machines are economy of cost, thorough mixing, and reducing the time of mixing to a point where the full advantage of the initial set of the cement is obtained. Concrete can be mixed with shovels by hand thoroughly if the proper amount of care and time is taken, but it takes so long to mix a batch of concrete by hand that many of the quick-setting cements began their initial set before the concrete is deposited in place.

Until recently there has not been, to our knowledge, a machine on the market costing less than several hundred dollars that could mix all the concrete that four men could shovel into it, and without taking up considerable room for the mixer and the boiler for furnishing steam, and without the expense of a skilled workman to handle the boiler and the engine of the mixer.

We have recently seen in Boston a concrete mixer consisting of a trough about 10 ft. long with a hopper at the top into which the stone, sand, and cement are thrown and with an arrangement of pins from one end to the other, and with a stream of water entering the mixer approximately half way down its length, which will give exactly the same process and result as mixing by hand, *i. e.*, the broken stone or gravel, sand, and cement are thoroughly mixed dry by striking a large number of pins in the upper half of the mixer and then coming in contact with the jet of water are thoroughly mixed wet through the rest of the mixer, coming out at the lower end into a wheelbarrow, bucket, or other suitable apparatus for conveying it to the desired place. The advantages of this mixer are self-evident. The concrete is mixed precisely as it is by hand or with the steam machine by being mixed thoroughly dry and then mixed again thoroughly after it is wet; and as the only power required is gravitation, there is no cost for power, fuel, or a skilled man to operate it. This machine is made so light that three or four men could lift it up and set it in place without the use of rollers, skids, or derricks. The cost of transportation and setting up the mixer is nominal.

This mixer can be used not only on large jobs where a thoroughly first-class concrete is desired in large quantities, but it can also be set up on small jobs where the cost of teaming a mixer, engine, and setting up would cost nearly as much as the labor to mix the concrete by hand.

EXTERIOR SCAFFOLDING.

THE custom in regard to scaffolding for the erection of the exterior of buildings differs in various parts of the country. In New England it is usual to erect an outside staging constructed usually of 4 by 4 uprights spaced 6 or 8 ft. apart, in double rows, and connected and braced by 6 in. boards, the scaffolding being carried to the top of the building. In New York more commonly the scaffolding is projected on putlogs, from story to story or the work of laying the face brick, etc., is done from each floor.

The question of which is the best is largely a matter of usage, but there is one way of looking at it which we think is worthy of consideration. If the building is anything more than the plainest kind of commercial structure, the architect likes to study it as it goes along. If the outside of the building is covered with staging from top to bottom, it is like working a typewriter which letters upside down. You cannot see what is being done until perhaps it is too late to make any change. On the other hand, if the staging covers only one story at a time, any imperfection, irregularity, or undesirable combination can be seen at once from the outside in its true proportions and full effect and can then be altered or remedied before the building is carried any higher.

It is the fond belief of New England contractors that they get better bricklaying in and around Boston than anywhere else in the country. We doubt if our New York brethren would quite agree to that; at any rate, we hardly believe that the alleged superiority is due entirely to the fact that outside stagings are used here. Certainly the opportunity of watching the building as it goes along is something that would be welcomed by every architect, and we all know how anxiously at times we have waited for the final removal of the staging, often in serious doubt as to whether this pet scheme of color or that detail would have its true effect, and we certainly should advise inside staging in every case where it is possible, in order to study the building as it goes along.

ELECTRIC CONDITION OF MODERN BUILDINGS.

THERE have been several paragraphs in some of the technical journals, which have been frequently repeated in the dailies, calling attention to the possibilities of destructive action by electrolysis, or by some possible but even more obscure process due to what is vaguely termed free electricity, which is supposed in some way to escape into the frame of a structure and work havoc with all its knuckles and joints.

No less an authority than General Sooy Smith has stated a belief that this is a tangible source of danger to the steel frames of the huge Chicago buildings.

If this is a danger, which is truly imminent, it certainly ought to be carefully considered and guarded against, and yet we can hardly believe that the amount of electricity which gets into the frame of a modern building is ever sufficient in amount to be even appreciable.

If electricity were in the habit of wandering around in the eccentric manner which sometimes characterizes the lightning flash, there might be more reason to fear for its action on the frame of a building; but no such eccentricity is habitually observed in any structure with which we have ever been familiar. In our Boston Subway, which is constructed with steel columns at the sides, and overhead steel beams, the possibility of electricity leaking from the overhead conductor to the overhead beams, thence to the columns and through the earth to the return conductor, is perfectly plausible, and, indeed, we are inclined to believe will in time present a real source of danger to the structure; but no such arrangement of conductors is ever met with in a commercial building, and we cannot believe that there is the slightest danger of electricity playing any such pranks with our steel frames as to endanger to any appreciable extent the security of its parts.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.—This is a period of transition and preparation in the real-estate and building world. Once fairly started on its course in September, business in ordinary years is likely to travel along prosperously and without serious interruption until the Christmas holidays, only the possibility of an unsound election being sufficient to make it pause in the late autumn. This year, fortunately, there is no issue in sight that is calculated to destroy confidence or upset the financial world, the only danger in that line at present being the remote possibility of a free silver victory in the Congressional elections — a possibility so remote that it may be dismissed without a thought.

It would seem, therefore, that we are to enter upon a season of steady business. It is true that the business of the past month has not even given a hint of coming activity, nevertheless the conditions are now right and we hear expressions of confidence on all sides. A feature that should not be lost sight of, and which is sure to be an improving factor, is the radical change that is coming to the transit facilities of the city within the next few months. I refer particularly to the near completion of the under trolleys on Sixth and Eighth Avenues. This will greatly help the outlying districts and the suburban towns, for in the long run it is accessibility that tells. Old New Yorkers may have their preferences and their prejudices, but to the newcomer the advantage of a single fare from his house to the City Hall is almost decisive when he selects his home.



ST. JAMES HALL, PHILADELPHIA, PA.
Rankin & Kellogg, Architects.



TERRA-COTTA DETAIL, PRESS BUILDING, 7TH AND SANSOM STREETS, PHILADELPHIA, PA.
Executed by the Standard Terra-Cotta Company.
T. P. Chandler, Architect.

We are no nearer to the possibility of having our great Public Library than when we last referred to the matter, owing to the economy of the present administration and the necessity for placing street lamps 10 ft. apart throughout all the adjacent corn fields, which act we of course do not criticize, as it is probably a charitable act to assist some starving contractor.

Among the few items of new work reported last month are: —

Charles C. Haight, architect, has prepared plans for a two-story brick warehouse to be built for the Trinity Church Corporation at a cost of $30,000.

George F. Pelham, architect, has planned a six-story brick store and loft building to be built at numbers 203, 205 Wooster Street; cost, $30,000.

Franklin Bayliss, architect, has planned a six-story brick mercantile building to be built on Prince Street, corner West Broadway; cost, $40,000.

Alexander M. Welch, architect, is preparing plans for three five-story brick flats to be erected on Riverside Drive near 87th Street; cost, $100,000.

I. G. Perry, State Architect, Albany, N. Y., has prepared plans for a three-story brick hospital building to be erected on Ward's Island; cost, $150,000.

PITTSBURGH. The expectation among architects during the spring and summer has been that when the war was over building operations would improve rapidly; but peace, which now seems assured, has come so late in the season that little improvement is looked for before the first of the year. While work of any importance is practically at a standstill, a great deal of small work is being done. This is principally small dwellings costing from $3,000 to $10,000; many are doubtless taking advantage of low prices and building homes for themselves, but the large number of them, and especially the fact that so many are going up in groups of from three to six or more, would seem to show that the high rents obtained here have attracted investors, and particularly those who have only a small ready capital, who see here an opportunity for obtaining a good return from their investments. When we remember that a house costing about $5,000 will rent for $50 a month, it seems that they are receiving at least a fair percentage.

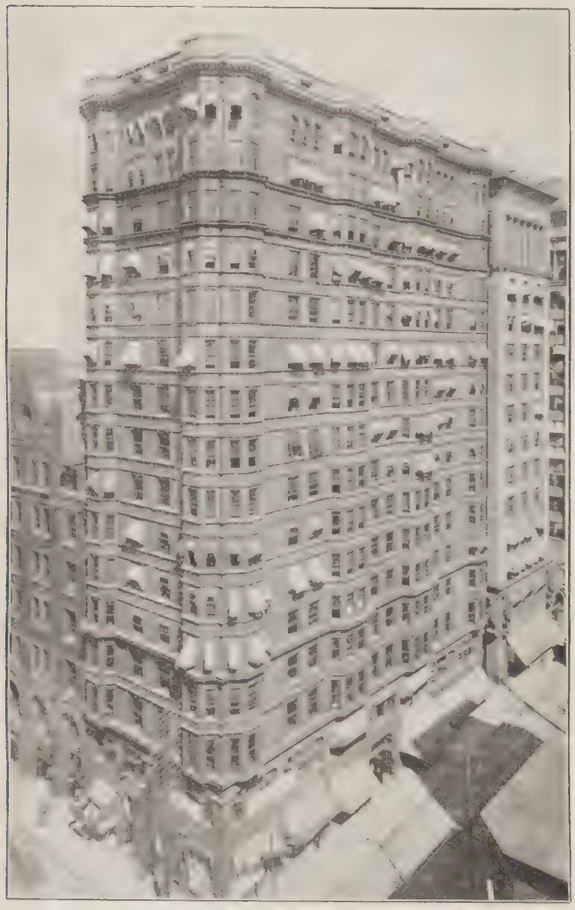
A noticeable fact here has always been the almost complete absence of apartment buildings and of flats, but this has also lately been receiving more attention. The new Schenley Apartments on Fifth Avenue, East End, will supply, for a time at least, the demand for a high-priced building, and a number of moderate

priced ones are now being put up or will be commenced soon, while several are being contemplated but are not far enough along to give particulars.

Rutan & Russell have recently let the contract for the new Edgeworth Club House to be built at Edgeworth, Pa.

Work has been commenced on the new building for the United Presbyterian Seminary Building in Allegheny. It is to be of brick and terra-cotta, and to cost $90,000. Struthers & Hannah are the architects. This firm is also preparing plans for an addition to the residence of Charles Lockhard, Highland Avenue, to cost about $45,000.

Alden & Harlow have prepared plans for a summer home for



CHEMICAL BUILDING, ST. LOUIS, MO.
The front brick used in this building was manufactured by the Illinois Supply and Construction Company.

Mr. Sol Smith Russell; it is to be built at Edgartown, Mass., and to cost $10,000.

Geo. S. Orth & Bros. are at work on a new house for Dr. Halleck, to cost about $12,000.

A new six-story apartment house to be built at Friendship Park has been planned by Architect De Arment.

Miss Mercur has planned the St. Francis de Sales Roman Catholic Church at McKee's Rocks; it is to be built of brick, and cost $40,000. She has also prepared plans for a new building for the Young Women's Seminary at Washington, Pa; cost, $25,000.

The Diamond National Bank has opened a competition for a new office and bank building, which they will erect next spring. T. D. Scott is the only local architect at work on this.

J. D. McShane will erect an apartment house on Highland Avenue. It is to be built of Roman brick and terra-cotta, and cost $100,000. Topp & Craig are the architects.



TERRA-COTTA CAP FOR SCHOOL NO. 7, BAYONNE, N. J.
Executed by the New Jersey Terra-Cotta Company.
Hugh Roberts, Architect.

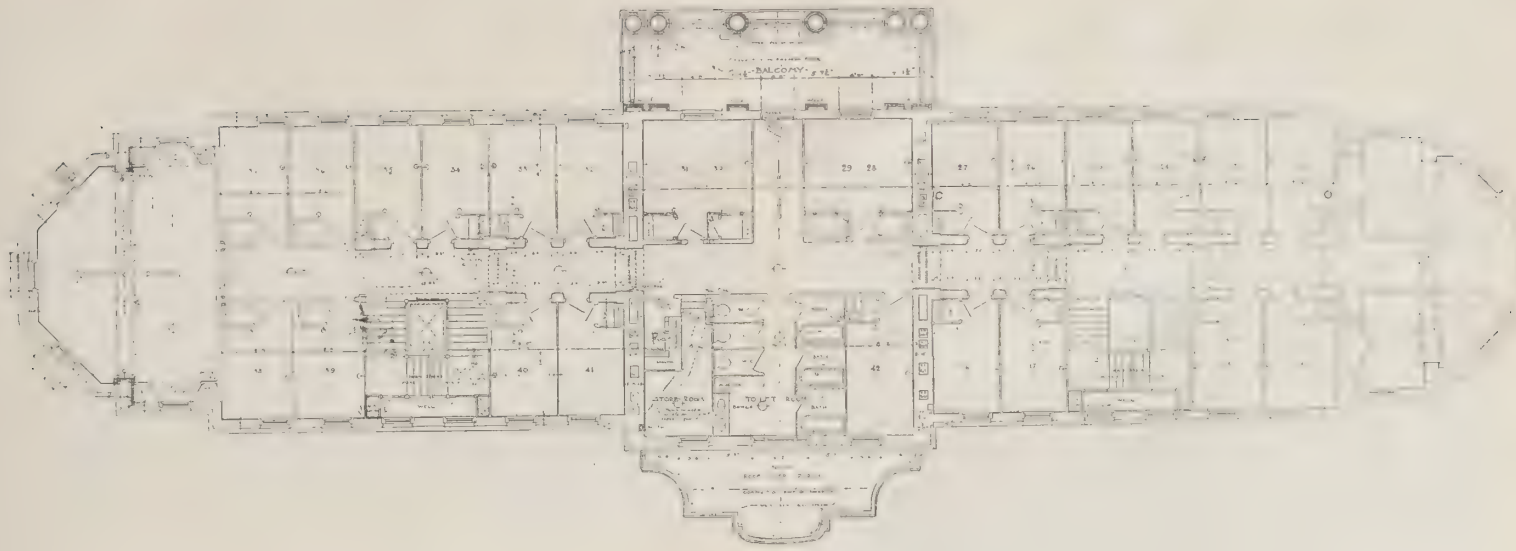
Great preparations are being made for decorating the city during the triennial conclave of the Knights Templars, which will be held here next month. Many large arches are being planned, to be built of staff. It is to be hoped that, with a material which lends itself so readily to work of such a character, they will surpass in design and artistic merit the arches ordinarily built on such occasions.

NEW TRADE PUBLICATION.

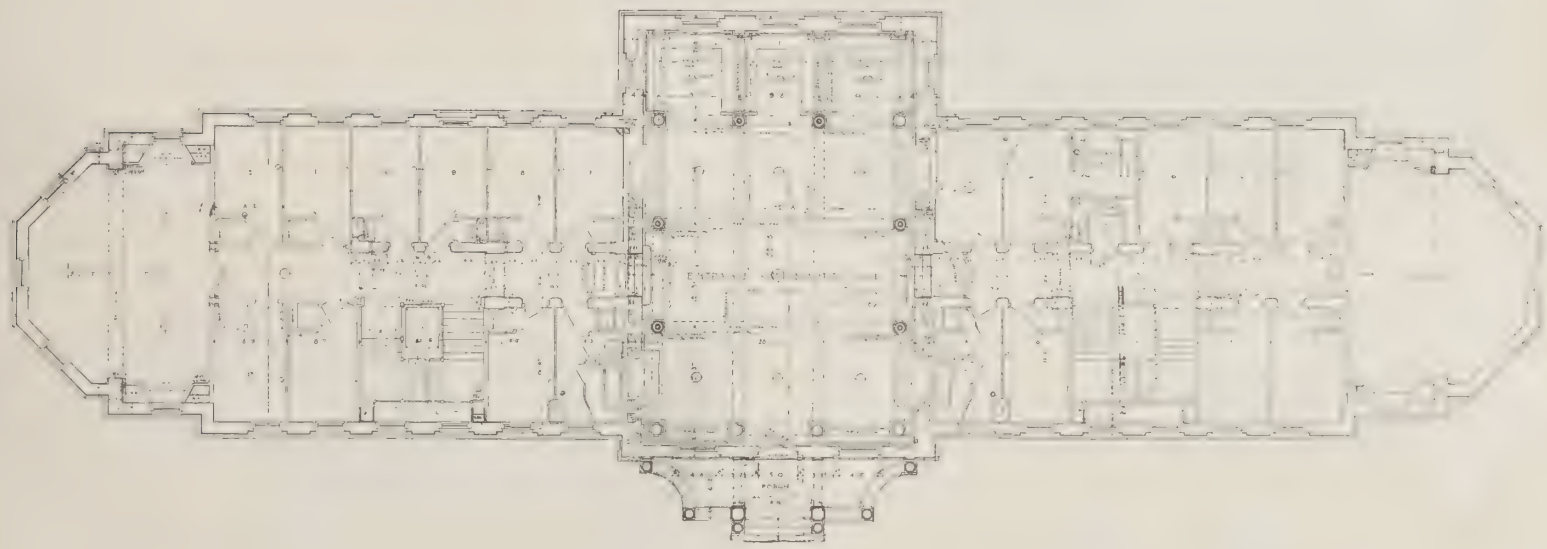
THE CONKLING, ARMSTRONG TERRA-COTTA COMPANY has published an attractive portfolio containing photographic reproductions of work executed by them, including general views of buildings, and carefully selected details. We have heard of an astute individual who undertook to collect an epitome of modern American architecture in the shape of the annual trade catalogues of the art industries. These really constitute a by no means bad measure of progress, and certainly in such a collection the representation of this company could be given a high place. Few of the art industries can show so entertaining a lot of really excellent work both in design and execution, and the terra-cotta which is shown by this portfolio of some seventy-eight plates is of a character which marks the publication as more than a mere trade catalogue. It has been a pleasure to illustrate some of the work of this company from time to time in these



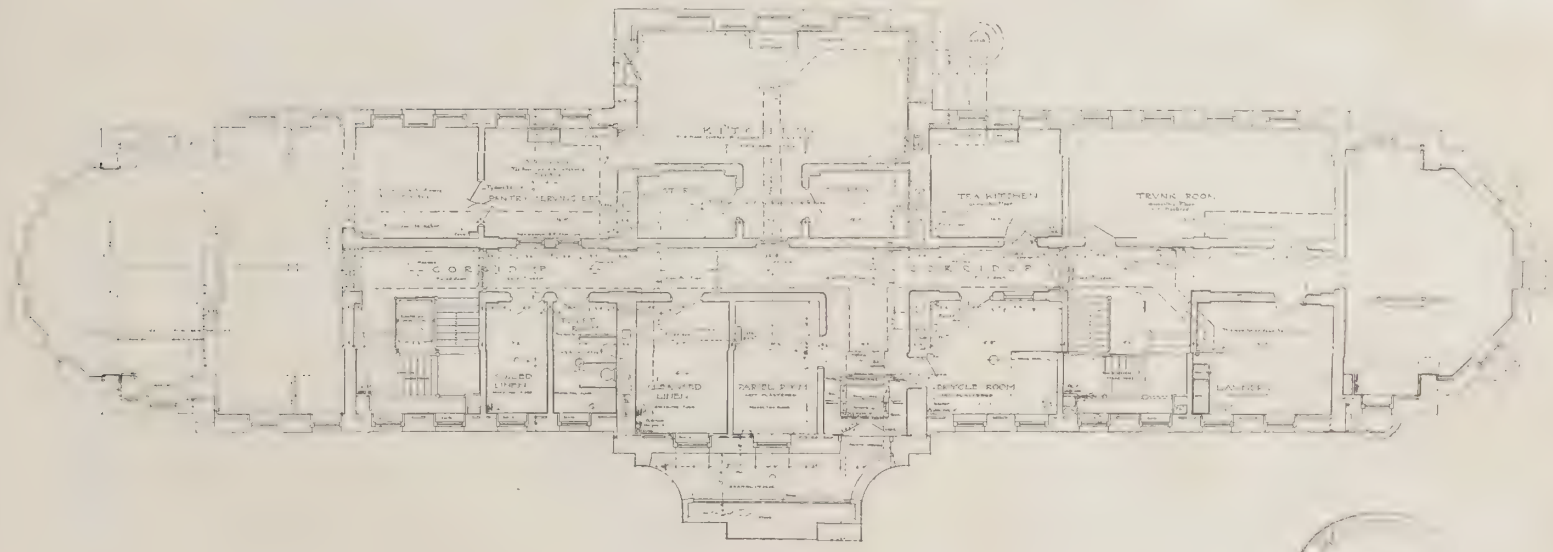
TERRA-COTTA DETAIL, DOYLESTOWN BANK, DOYLESTOWN, PA.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Baker & Dallett, Architects.



SECOND FLOOR.



FIRST FLOOR.



BASEMENT.

CITY HOSPITAL, BOSTON. THE ANN WHITE VOSE BUILDING. DWELLING FOR NURSES.
Wheelwright & Haven, Architects.

columns, and the company has been fortunate in having opportunities of executing some of the best work which has been put on the market. The company is also fortunate in the possession of the



FINIAL OVER MAIN ENTRANCE, BAYARD BUILDING, NEW YORK CITY.
Executed by the Perth Amboy Terra-Cotta Company.
Louis H. Sullivan, Lyndon P. Smith, Architects.

artistic mechanics who are able to turn out work of this high character; and now it is the architectural public which is fortunate in having these various fragments collected in permanent shape where they can be, perhaps, more fully appreciated in detail than even in the building itself. We suppose that in common with every large manufacturer of terra-cotta the Conkling, Armstrong Company is not always allowed to do its best, that some of its terra-cotta is necessarily of the nature of pot-boilers which it would not care to illustrate, but the selection manifested in this catalogue shows the possession of a degree of good taste which argues well for the cooperation the architect may expect who looks to them for the artistic execution of his ideas.

CURRENT ITEMS OF INTEREST.

POWHATAN cream-white bricks have been specified for fronts of three flats and store buildings, East Broadway, Clinton, and Division Streets, New York City.

THE DAGUS CLAY MANUFACTURING COMPANY is supplying buff and fire-flashed brick for a new block at Philadelphia for which John Anderson is architect.

GABRIEL & SCHALL report increasing sales of their Precipitated Carbonate of Barytes among the leading clay-workers of the country.

THE ILLINOIS SUPPLY AND CONSTRUCTION COMPANY have rebuilt entirely of brick their plant recently destroyed by fire, and began on the fifteenth of the month the execution of several new orders.

THE Chesebrough Building, an eleven-story structure now being erected at Pearl and State Streets, fronting Battery Park, New York City, will be of Powhatan cream-white brick.

SANDERSON & PORTER, contractors for the Meriden & Compounce Electric Railroad Company, have let the contract for furnishing several bridges and buildings on the line of this road to the Berlin Iron Bridge Company, of East Berlin, Conn.

THE KITTANNING BRICK AND FIRE-CLAY COMPANY are furnishing interior linings for the Toombs, New York City, and Collins Farm Hospital, Collins, N. Y., also exterior brick for school buildings at Brookville, Pa., and Corry, Pa.

THE DAGUS CLAY MANUFACTURING COMPANY is supplying through their Buffalo agent, John H. Black, the fire-flashed Roman brick being used in the new Park Theater, Niagara Falls, N. Y., Orchard & Joralemon, architects.

JOHN H. BLACK, representing the Kittanning Brick and Fire-Clay Company, at Buffalo, is supplying the buff bricks being used in the addition to the Collins Farm Hospital, Collins, N. Y., Aug. C. Essenwein, architect.

THREE hundred thousand buff Norman face bricks, manufactured by the Kittanning Brick and Fire-Clay Company, will be used in the new Third Ward Public School Building, Allegheny, Pa. This is said to be the largest building of its kind in the State of Pennsylvania.

THE BRICK, TERRA-COTTA, AND SUPPLY COMPANY, Corning, N. Y., have recently closed contracts for furnishing the terra-cotta for the following new buildings: Public School, Utica, N. Y.; German Evangelical Church, Elmira, N. Y.; St. Joseph's Church, Hoboken, N. J.; Diven Block, Elmira, N. Y.; R. C. Church, Auburn, N. Y.; House of Friendless, Williamsport, Pa.

THE TIFFANY ENAMELED BRICK COMPANY, of Chicago, has been awarded the contract to furnish their white English size *dull finish* enameled brick for the front (six stories) of the Mithoff



DESIGN OVER WINDOWS OF CENTRAL PARK PUMPING STATION, CHICAGO, ILL.
Executed in terra-cotta by the Northwestern Terra-Cotta Company.
Bruce Watson, City Architect.

Building, at Columbus, Ohio. The trimming will be of white enameled terra-cotta furnished by the American Terra-Cotta and Ceramic Company, also of Chicago. Messrs. Stribling & Fox, of Columbus, are the architects.



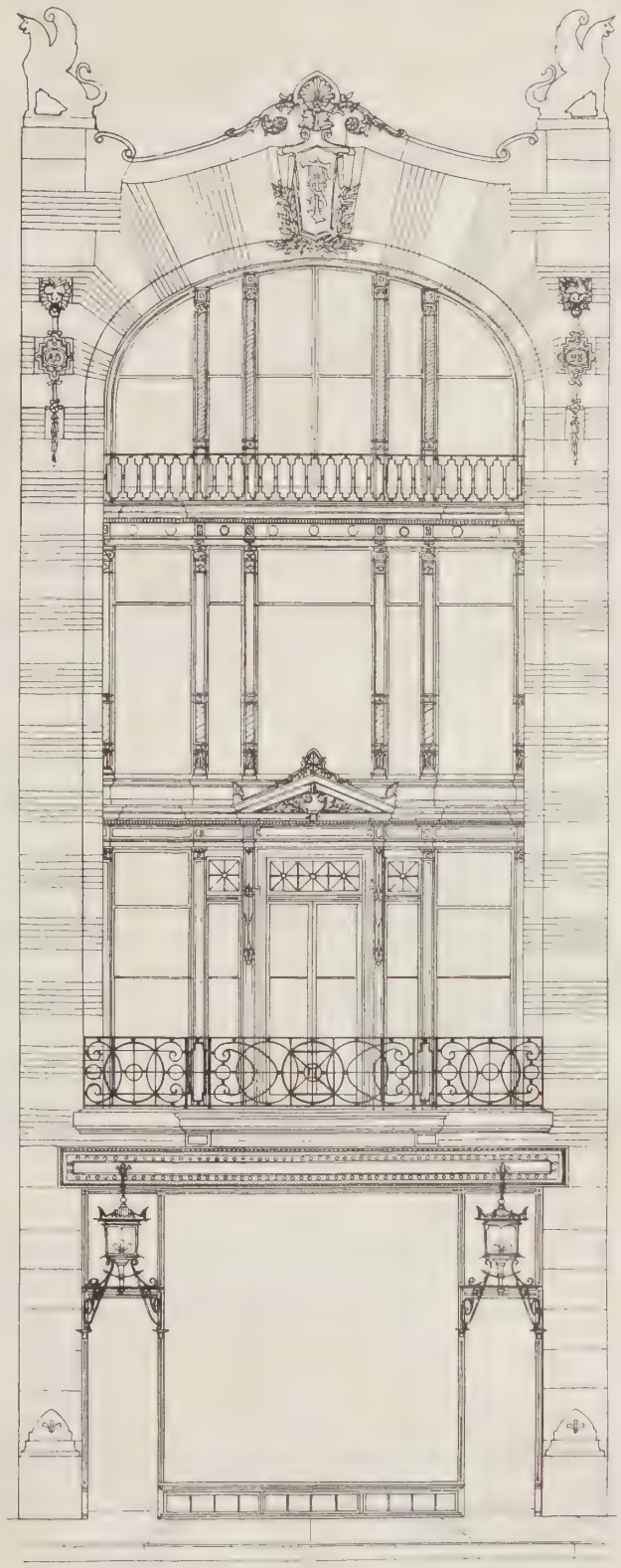
ROWE DEPARTMENTAL STORE, PITTSBURGH, PA.
Architectural terra-cotta furnished by the Winkle Terra-Cotta Company, St. Louis.
Brick by the New York Hydraulic-Press Brick Company.
Alden & Harlow, Architects.

The Evans & Howard Fire-Brick Company are supplying 75,000 buff Roman brick for a building at Spokane, Wash., Cutler & Malmgren, architects; an order for buff standards at Green Bay, Wis.; buff standards for a new building at Platteville, Wis., of which Henry Ives Cobb is the architect; also the terra-cotta for the new building of the Electric Railway and Light Company, at Milwaukee.



MAIN ENTRANCE, ROWE DEPARTMENTAL STORE, PITTSBURGH, PA.
Alden & Harlow, Architects.

The Pittsburgh Terra-Cotta Lumber Company has added to its works one at East Palestine, Ohio, where they intend making only fire-clay tile. This, with the works now at Port Murray, N. J., and Pittsburgh, Pa., gives the largest production of any company in the hollow-tile or porous terra-cotta fire-proofing business and enables them to reach north, south, east, and west with the lowest freight rates obtainable.



STORE AND OFFICE FRONT, TORONTO, CAN.
Arthur E. Wells, Architect.

THE estate of C. M. Robertson, Montville, Conn., recently lost by fire their boiler house. In order to obviate, if possible, a like experience in the future, they have decided to put up a thoroughly fire-proof construction in its place. The building will have steel framework, brick side walls, and an absolutely fire-proof roof, consisting of corrugated iron covering laid on the Berlin Iron Bridge Company's Patent Anti-condensation Roof Lining.

MR. ROSS C. PURDY, of Buffalo, was the successful contestant for the scholarship in the Department of Ceramics of the Ohio State University, established by the National Brick Manufacturers' Association, and will accordingly have charge of the experimental work under Professor Orton's direction for the next school term, which began September 14.

THE following contracts are reported by the Celadon Terra-Cotta Company: Sherman School Building, St. Louis (flat shingle); Eliot School Building, St. Louis (flat shingle); residence for W. D. Orthwein, St. Louis (flat shingle); a row of residences for Union Mutual Life Insurance Company, Chicago, S. S. Beman, architect; building for Cook County Normal School, Chicago (closed shingle), N. S. Patton, architect; station for Union Railway Company, Des Moines, Ia. (10 in. Conosera).

THE NEW JERSEY TERRA-COTTA COMPANY will furnish the architectural terra-cotta for the following buildings: Apartments, corner 139th Street and St. Ann's Avenue, New York City, John C. Burne, architect; Manhattan Improvement Company, owners and builders; apartments, West End Avenue and 106th Street, New York City, Neville & Bagge, architects; Daily & Carlson, owners and builders; School No. 7, Bayonne, N. J., Hugh Roberts, architect; T. Burke, builder; factory, Bridgeport, Conn., Dowling & Bottomley, builders for The Union Metallic Cartridge Company.

THE ATLANTIC TERRA-COTTA COMPANY, office, 287 Fourth Avenue, New York City; factory, Tottenville, Staten Island, N. Y., wish to announce that they are now prepared to furnish architectural terra-cotta for all styles of work and would be pleased to render estimates on same.

The plant at Tottenville which the company has recently erected is thoroughly equipped with the most approved machinery for the manufacture of terra-cotta, and is in charge of men of skill and experience in this line of work. The location of the factory is such that material can be shipped either by rail or water to any part of the country.

The company guarantee the prompt and satisfactory fulfilment of all contracts undertaken by them.

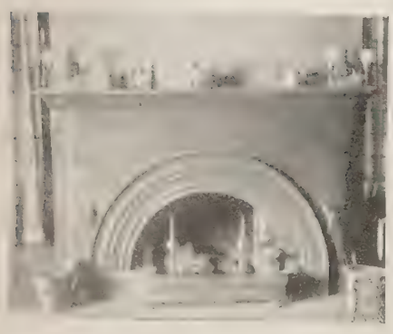
HOLMES, BOOTH & HAYDENS, Waterbury, Conn., are making extensive repairs and additions in their plant. The Berlin Iron Bridge Company, East Berlin, Conn., have secured the contract for the steel roof work for the boiler room, 40 by 80 ft.; the new muffle room, 35 by 80 ft.; and the new brass mill, 118 by 90 ft. These new additions are to be fire-proof throughout. The side walls are of brick, the roof supports are of steel, and the covering corrugated iron. The roofs are arranged with skylights for lighting the interior of the building, and monitors for ventilation.

THE works of the Cummings Cement Company, of Akron, N. Y., are running night and day in order to supply a number of large contracts, among which may be mentioned that of supplying fifty thousand barrels of Obelisk brand of rock cement in the construction of the Ohio Steel Company's new plant at Youngstown, O.





Fireplace Mantels.



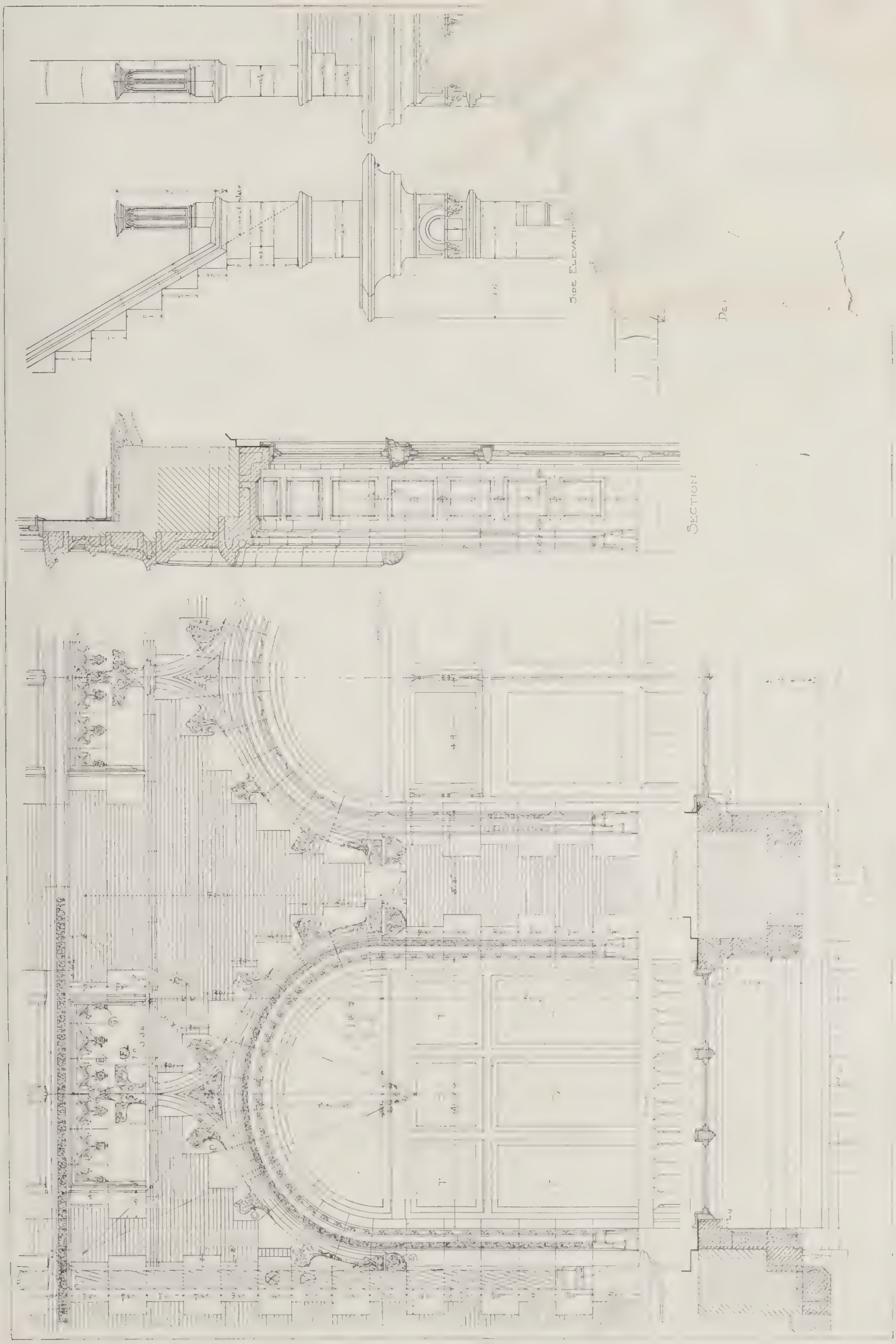
The best ones to buy are those we make of Ornamental Brick. There's nothing else as good or as durable. Our mantels don't cost any more than other kinds, and are far better in every way—our customers say so. Don't order a mantel before you have learned about ours. Send for our Sketch Book showing 53 designs of mantels costing from $12 upwards.

Phila. & Boston Face Brick Co.,
15 LIBERTY SQ., BOSTON, MASS.



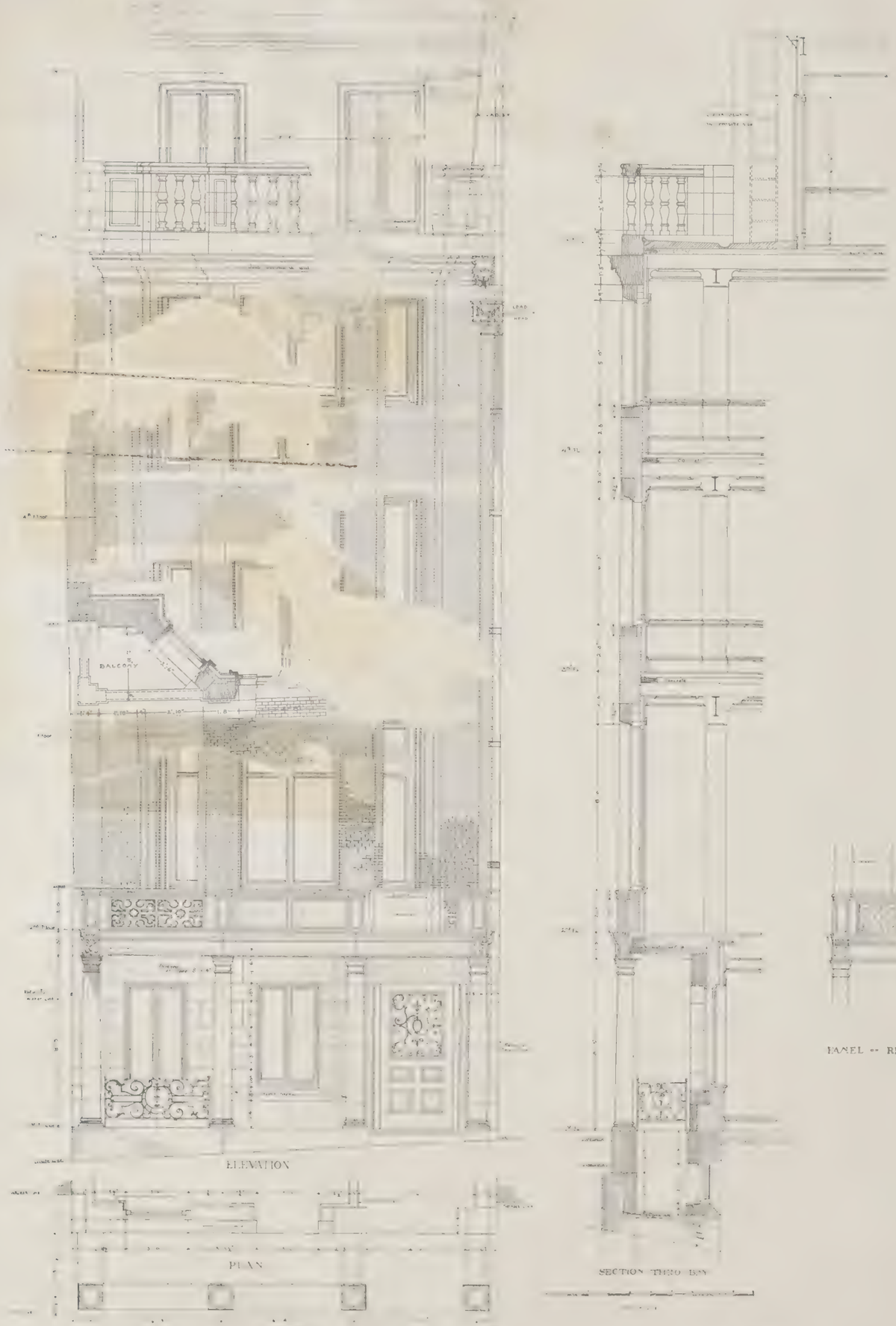
ST. JAMES HALL, PHILADELPHIA, PA.

RANKIN & KELLOGG, ARCHITECTS.



DETAIL OF ENTRANCE TO AUDITORIUM, ST. JAMES HALL, PHILADELPHIA, PA.

RANKIN & KELLOGG, Architects.



HOUSE, BEACON STREET, BOSTON.

R. CLIPSTON STURGIS, ARCHITECT.

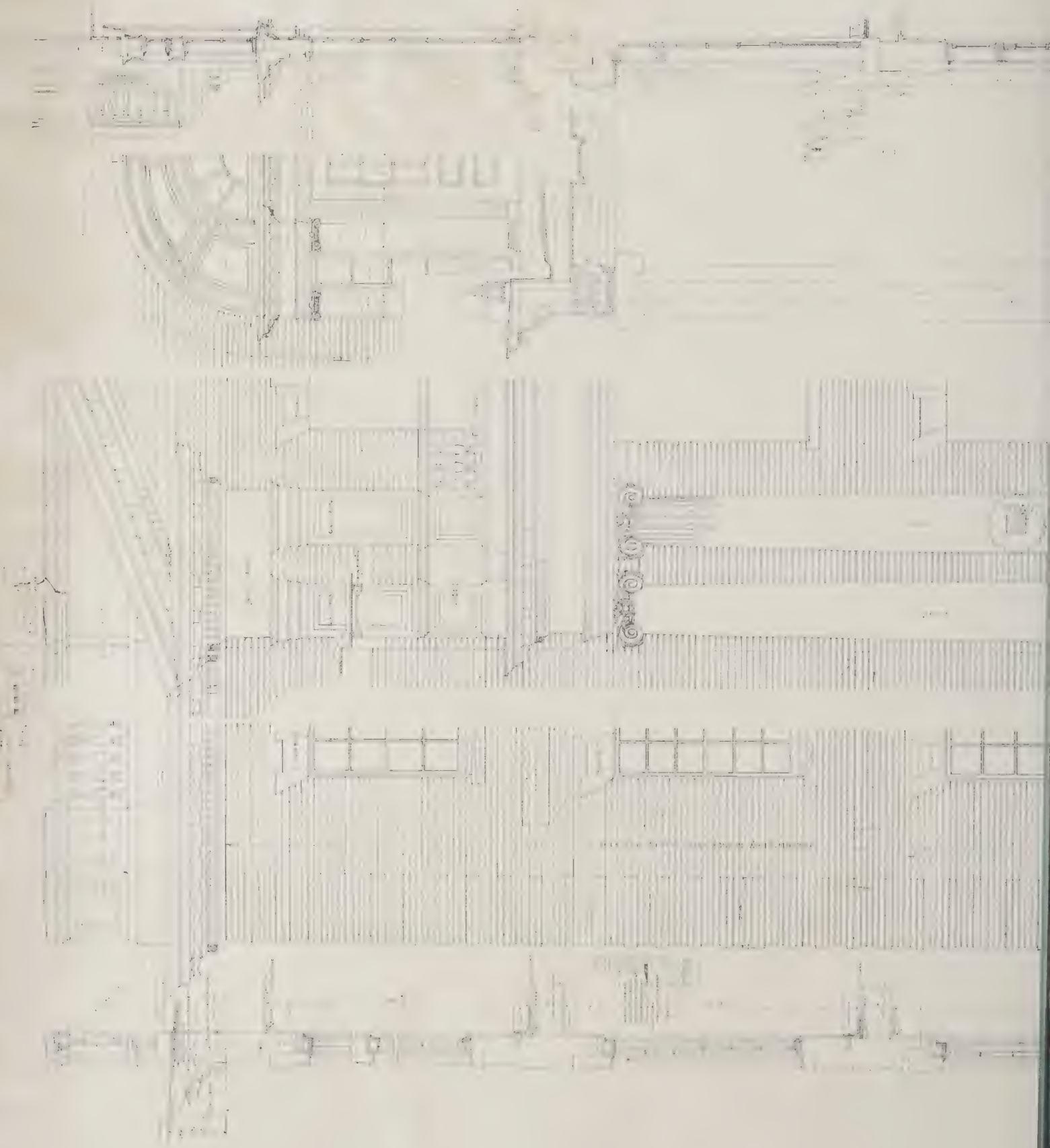
BOSTON PUBLIC LIBRARY

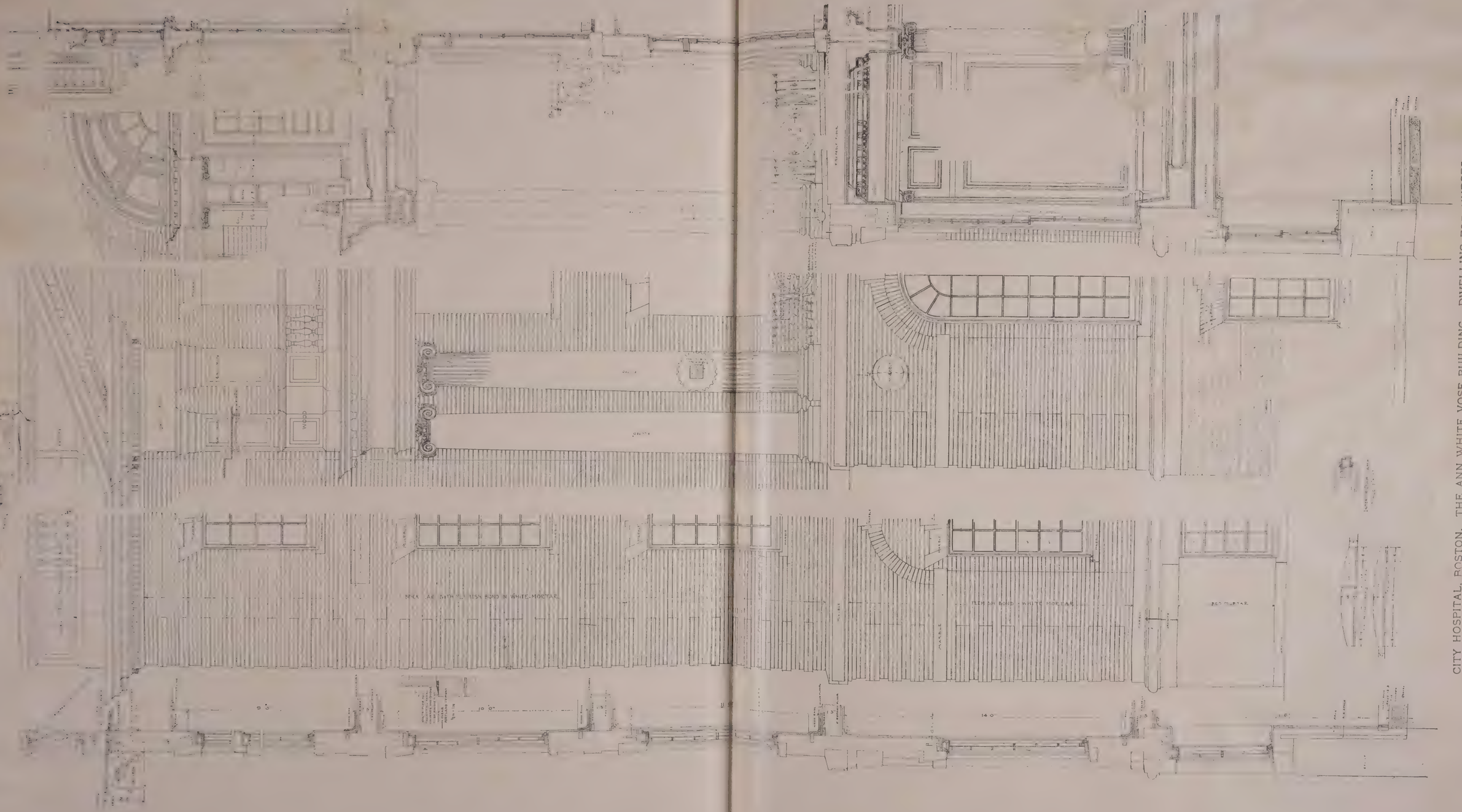


West Elevation.

CITY HOSPITAL, BOSTON. THE ANN WHITE VOSE BUILDING. DWELLING FOR NURSES.

WHEELWRIGHT & HAVEN, Architects.





CITY HOSPITAL, BOSTON. THE ANN WHITE VOSE BUILDING. DWELLING FOR NURSES.

PLANS SHOWN ON PAGE 195.)

WHEELWRIGHT & HAVEN, ARCHITECTS.



The facade of the building is cut at the left in the illustration. it being the same as that shown at the right.

SOUTH ELEVATION

SCALE OF FEET

CITY HOSPITAL, BOSTON. THE ANN WHITE VOSE BUILDING. DWELLING FOR NURSES.

WHEELWRIGHT & HAVEN, ARCHITECTS.



NORTH ELEVATION

CITY HOSPITAL, BOSTON. THE ANN WHITE VOSE BUILDING. DWELLING FOR NURSES.

WHEELWRIGHT & HAVEN, ARCHITECTS.

The facade of the building is c
the right in the illustration, it
the same as that shown at the

BOSTON PUBLIC

VOLVME VII OCT. 1898 No. 10

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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HARD TIMES AND HIGH IDEALS.

WE remember a very interesting friend of an extremely religious turn of mind who used to assert that one could not be in a truly pious frame of mind unless he was a little bit hungry. Applying the same reasoning to hard times and art, architecture and building ought to show some pretty high ideals just at present, for, notwithstanding the repeated asseverations of the daily press that good times are upon us, we know by sad experience to the contrary. The volume of business may be large, but the margin is extremely small. The hope that springs perennially leads us to anticipate all sorts of delightful possibilities for 1899; but while we are passing through the hard times, it is, perhaps, not amiss for us to prepare for the fat years by brushing up our morals and adjusting our ideals. In the scramble for work, the keen, relentless competition which always accompanies the dull season, it is very easy to drop some of our restraints and to feel that we must get work, honestly and fairly if we can, but we must get it, and the temptation to ignore ethical ideas is one which assails the mechanic and tradesman no less than the architect and constructor. The lean years which are upon us are surely not warmly desired, and yet, like many of our earthly discomforts, they may be turned to a good purpose. We know of one large manufacturer whose output has been largely reduced, profits cut almost to nothing, and expenses increased beyond expectation, who deliberately sets himself to take advantage of the dull season by improving the quality of his product, experimenting with new methods, and, by developing his present methods, striving to be ready for the boom when it shall come. We have in mind a prominent dealer in building material who takes advantage of the slack times to cultivate the acquaintance of his business friends, making new connections and incidentally gathering many ideas which in the rush of business would be beyond his reach. We hear of several architects who are now able, for the first time in several years, to have long, serious talks with some of their contractors, with mutual benefit, and who are utilizing the enforced period of leisure by kinds of study which have been denied them when their offices were more crowded. We regret the hard times, we all want the income; but if we can build up our ideals, thereby making our occupation a part of ourselves, making it less a drudgery, the experience may not lack in positive value for the future. At any rate, because we are not building palaces we need be no less conscientious in our henhouses, and if we are not all of us occupied with State capitols, we can at least get some pretty good results out of the spare tables and chairs which our kind friends allow us to design.

THE time may have been once when success in architectural design was a matter of accident, or when those to whom the creation of great buildings was entrusted could depend upon their instincts and the inspiration of the Muses; but we have changed all that with our modern civilization, and if there is any one profession of to-day that requires long and arduous preparation, it is that of the architect. Constant, unremitting study is the only safe program for the man who would take rank. It has been our editorial privilege to be called upon repeatedly for advice to those who contemplate becoming architects. The usual rule is to find the young man eager to enter an office, anxious to begin actual work, looking forward to immediate worlds of conquest. Even when a kindly restraining influence has harnessed him into the routine of one of our best technical schools, his impulse after graduation is still to build, to hang out his shingle, to get to work, and the idea seems to be that if by some mental *tour de force* he can compress into three years the amount of study that is laid out for five or six, it is well worth the effort. The difference between this point of view and the principle which seems to actuate the French students of architecture goes, perhaps, a considerable way towards explaining the manifest superiority of the French school in its methods. With us the aim is to complete the studies as speedily as possible and start to work. With them it is not in how little time can education be acquired, but rather how many years can the student devote to preliminary training. It is often discouraging to the aspirant, who has, perhaps, come from the Institute flushed with his diplomatic honors, to be told to take a humble seat and keep on studying for five or six years more before he allows his kind friends to give him a job, but all experience shows that our young men are apt to start too soon rather than to delay too long, and that, other things being equal, the man who hangs out his sign and begins his professional career with the greatest amount of experience behind him will have the richest measure of true success. The secret of success in any profession, in these days, is not inspiration, not native talent, nor even that *sine qua non* of the architect, good and complacent friends, but thorough preparation and unlimited, hard dig.

PERSONAL AND CLUB NEWS.

JAMES L. CHESEBRO, architect, Hartford, Conn., has moved his office to 50 State Street.

B. HAMMETT SEABURY, architect, has moved his offices to the Besse Building, 368 Main Street, Springfield, Mass.

ALONZO T. HARMER, architect, has opened an office at 114 Liberty Avenue, Jamaica, N. Y. Catalogues and samples desired.

H. E. BONITZ, architect, Wilmington, N. C., will be glad to receive manufacturers' catalogues and samples.

WALTER H. KILHAM, architect, has opened an office in the Phillips Building, 120 Tremont Street, Boston. Catalogues and samples desired.

WALTER I. GIDEON, architect, formerly of Washington, D. C., has opened an office in the Sheppard Building, Springfield, Mo. Catalogues and samples desired.

THE firm of Brainerd & Holsman, architects, Chicago, has been dissolved by mutual consent. Mr. Holsman will continue the business with offices in the Young Men's Christian Association Building, Chicago.

ON the evening of September 28, the Builders' Club, of Chicago, tendered a "smoker" to the members of the Chicago Architectural Club.

BOHEMIAN Night was observed at the Chicago Architectural Club on the evening of September 19. Messrs. Frank W. Kirkpatric, Wm. H. Eggebrecht, August C. Wilmanns, J. C. Llewellyn, N. Max Dunning, A. G. Zimmerman, and Clarence Hatzfeld were hosts.

MR. FRITZ WAGNER, of the Northwestern Terra-Cotta Company, has offered three prizes: first, of $50; second, of $30; third, of $20, for the three best designs for a terra-cotta column and lintel with wall surface above, to be competed for by members of the Chicago Architectural Club.

THE T Square Club, of Philadelphia, with its usual and commendable spirit, appointed a special committee to consult with the municipal authorities in regard to the decorations and architectural accessories which were to be erected and displayed along the line of march for the Peace Jubilee. Although their services were not accepted on this occasion, arrangements having progressed too far to permit of alterations, as a result of their overtures they have been promised the supervision of the work on the occasion of the next national reunion of the G. A. R., which will be held at Philadelphia next year.

THE St. Louis Architectural Club met on Saturday evening, October 1. Reports of the different committees were received; $40 was appropriated for the use of the Lantern and Lecture Committee, and $100 for the Library Committee. Mr. B. H. Brown gave the club Owen Jones's "Grammar of Ornament," and Kidder's two volumes on "Building Superintendence"; Mr. Neimann, the first volume on "Architecture," by T. Roger Smith, and Mr. Enders gave the four volumes of the "Kensington Schools on Construction." The committee reported that the controversy between the club and the local chapter A. I. A. had been amicably settled, and Mr. C. K. Ramsey, of the chapter, was present and gave a little talk.

THE T Square Club held its first regular meeting of the present season on Wednesday evening, October 5, at which a large number of members were present. The subject for competition at the meeting was "Sketches Made by Club Members During the Past Year," and mentions were awarded as follows: First mention, John J. Dull; second mention, Oscar M. Hokanson; third mention, James P. Jamieson. The third annual exhibition of the club, in conjunction with the exhibition of paintings and sculpture, is to be held at the Academy of the Fine Arts, Jan. 14, 1899, to Feb. 2, 1899. The Jury of Selection and Hanging Committee for the Architectural Exhibit will be composed of Mr. John Galen Howard, of New York, Mr. C. Howard Walker, of Boston, and Messrs. Edgar V. Seeler, Adin B. Lacey, Herbert C. Wise, Horace H. Burrell, David K. Boyd, James P. Jamieson, and William L. Bailey, of Philadelphia. All correspondence regarding the exhibition should be addressed to Albert Kelsey, Corresponding Secretary, 931 Chestnut Street, Philadelphia.

THE Chicago Architects' Business Association has passed a resolution declaring that it is the duty of the Illinois State Board of Examiners to prevent the practise of the profession of architecture by all unlicensed persons, and to cause actions to be brought against offending parties. The association, at its annual meeting, decided that it would instruct its attorney to institute proceedings to compel the examining board to enter these actions, and to prevent the board from paying the funds it collected into the State treasury until the expense of such prosecutions had been paid. The Architects' Association also passed a resolution sustaining the professional character of the work of Normand S. Patton as school architect. — *Const. News.*

HARWOOD HOUSE, ANNAPOLIS.

PLATES 73 and 74. This house was designed by Buckland, and built between 1770 and 1780. It was made low in order not to intercept the harbor view of the Chase House, which stands directly opposite. The brick is laid in Flemish bond, with quarter-inch mortar joints, and is of the rich color peculiar to Southern colonial work. The exterior detail is finely carved wood, and the interior is handsomely decorated throughout in a similar manner. The parlor in the rear of the first story leads directly out on the garden and is handsomely decorated in arabesque.

The house was built for William Hammond, an Annapolis lawyer. It was sold to Chief Justice Chase, and has remained in the family of his granddaughter, wife of William Harwood.

ILLUSTRATED ADVERTISEMENTS.

THE Bank of McKeesport, McKeesport, Pa., Longfellow, Alden & Harlow, architects, is illustrated in the advertisement of the Harbison & Walker Co., page xv.

Townsend Memorial Hall, Ohio State University, Peters, Burns & Pretzinger, architects, is illustrated in the advertisement of the Celadon Terra-Cotta Co., Ltd., page xxvii.



TERRA-COTTA WINDOW MULLION.
Executed by the New York Architectural Terra-Cotta Company.

The American Schoolhouse. XII.

BY EDMUND M. WHEELWRIGHT.

(As the writer has been unable to collect all the material requisite for the completion of these papers following the order first intended, it has been found necessary, in order not to break the issue, to give now the specifications for a school building which was promised in the announcement of the editors. The other subjects will be treated in later issues.)

SPECIFICATIONS FOR A SCHOOL BUILDING.

SECTION 1. THE WORK TO BE DONE IS TO — (*a*) Erect and complete with materials and workmanship of the best quality and character, unless definitely specified to be otherwise constructed, the [Blank] School Building upon a site, at the corner of [Blank] and [Blank] streets, [city,] [State;] the building is to be of brick with stone trimmings, and the contractor is to furnish and do to the satisfaction of the architect everything required therefor, except that the contractor, unless otherwise specifically provided in these specifications, is not to furnish or install the plumbing, or the heating, or ventilating apparatus, including all metal ducts, registers, screens, netting, etc., required for any of said apparatus, or the movable furniture, or the wiring for the electric lighting, electric clocks, bells, or telephones; but the contractor is to do all jobbing required in connection with the work of installing the plumbing, heating, and ventilating apparatus, and the placing of said electric wiring, tubing, and fixtures, including the furnishing and putting up of boards for the support and covering of pipes, and the doing of all cutting, fitting, and filling necessary for the completion of the building in connection with said plumbing, heating, and ventilating apparatus, wiring, tubing, and fixtures, or any of them. No cutting shall be done without permission of the architect.



THE DE LANCEY SCHOOL, PHILADELPHIA, PA.
George C. Mason, Architect.
This school has a twofold purpose — first, to prepare boys for college, or a school of science, and secondly, to give a satisfactory English education to such boys as do not expect to take a collegiate course.

(*b*) The contractor shall carefully protect the work from injury from the weather and from water, frost, accident, or other cause, and repair any such injury; shall make good any defect, omission, or mistake in the work within such time as shall be required in any notice so to do, signed by the architect and given to the contractor or mailed to him at the business address stated by him in his proposal, whether so given or mailed during the progress of the work or after its completion, and whether any inspection or approval of, or payment for, the work or any part thereof may have been made or certificate for such payment given.

(*c*) The contractor shall furnish and maintain temporary doors and screens for all openings in the building, and protect the work from the weather whenever the architect shall so direct. The contractor shall supply heat and attendance for drying out and protecting the building during construction.

(*d*) The owner will permit the use of the boilers by the contractor when the mains and returns for addition have been installed and when the contractor has installed the temporary radiators as hereinafter provided. Before such possible use of the boilers, etc., for heating the building the contractor shall, when required by the architect, furnish temporary heaters, stoves, fuel, and competent attendance for the same, and shall maintain the heating as required until otherwise directed in writing by the architect. The contractor shall leave the boilers in perfect condition at the termination of his use thereof and he shall then supply and set new grates for same.

When mains and returns are installed the contractor shall furnish and connect temporary radiators, and is not to remove the same until so ordered in writing by the architect. Heating will be required for the protection of the work, for the drying of plaster, and continuously while interior finish is being set and painted, and for thirty-one days after the acceptance of the building by the architect.

(*e*) The contractor shall furnish and lay all water-pipes, gas-pipes, and drains from inside the walls of the building to, and connect the same with, the street mains, as shown on plans or as directed by the architect.

(*f*) The contractor shall furnish and maintain a temporary water-closet approved by the architect, in the place shown on the plan or as directed by the architect, and allow the same to be used by every person doing anything relating to the erection and completion of the building, whether under this contract or others, and carry out all directions relating to such water-closet and its placing and removal given by the architect.

(*g*) The contractor shall take charge of and be liable for any loss of or injury to any materials delivered on, or in the vicinity of, the work to be used thereon, whether furnished by the owner or otherwise; notify the architect as soon as any such materials are so delivered, and furnish men to handle them for examination by the architect or his assistants; and keep trimmed up in piles so placed as not to endanger the work all such materials, and all refuse, rubbish, and other materials not removed.

(*h*) The contractor shall pay all water rates for water required for anything in connection with any work on the building until its completion, and pay all other charges and fees incident to the doing of the work.

(*i*) The contractor shall leave an unobstructed way along public and private ways for travelers, street cars, and teams, and for access to hydrants; from the beginning of twilight through the whole of every night maintain near all places in the public ways obstructed or made unsafe by him sufficient lights to protect travelers in such ways from injury; provide proper walks for travelers over and around such places; provide and use all other lights, fences, guards, and watchmen on and about the work as directed by the architect; provide all necessary bridges and ways for access to

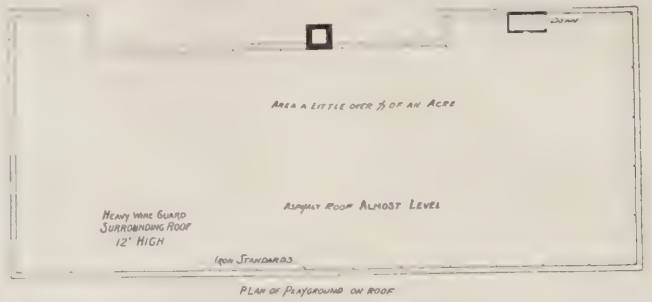
property where the existing access is cut off by him, and see that the neighboring residents are not unnecessarily inconvenienced; take all proper precautions to protect persons and property from injury by the carrying on of the work.

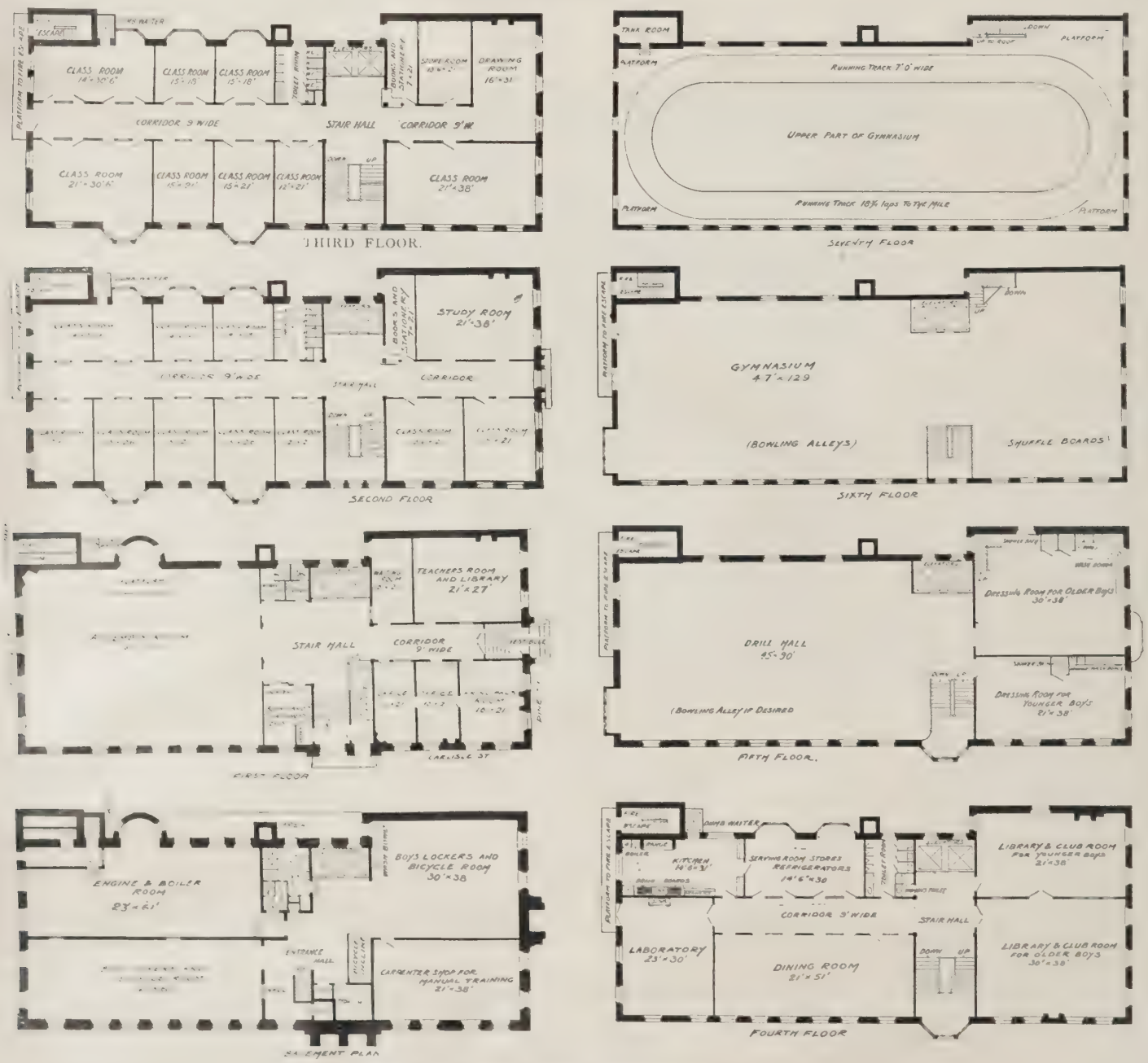
(*j*) The contractor shall replace or put in good condition, satisfactory to the architect, any tree, or public or private way, or sewer or drain, or water, gas, or other pipe, or catch-basin, wire, building, fence, or other structure interfered with by him, and not required to be removed under this contract.

(*k*) The contractor shall promptly remove from the work and its vicinity all materials rejected when so directed by the architect and he shall remove promptly all rubbish when so ordered by the architect.

(*l*) The contractor shall maintain the flow in all water-courses, sewers, drains, and pipes interfered with by him, or convey the flow in covered channels to a suitable point of discharge, in such a manner as not to flow upon or hinder the other work or cause any nuisance.

(*m*) The contractor in doing the above shall, so far as they go, conform to — these specifications, to — the plans and drawings marked [here quote in full the title given to the drawings] and numbered 1 to (say) 15 inclusive, furnished by said [here give in full the name of the architect and the business address], to — any directions given, and detail plans and working drawings furnished by said architects and to — all orders in writing of said architects when approved by the owner, increasing the quantity or taking away any part of the work, or making any change in the form, materials, plans, or specifications of the work, or requiring the contractor to furnish any extra work or materials relating to the above: and shall cause all directions, relating to the work, given by the architect, to be promptly carried out, and everything to be completed on or before [Blank]. Said architects





THE DE LANCEY SCHOOL, PHILADELPHIA, PA.

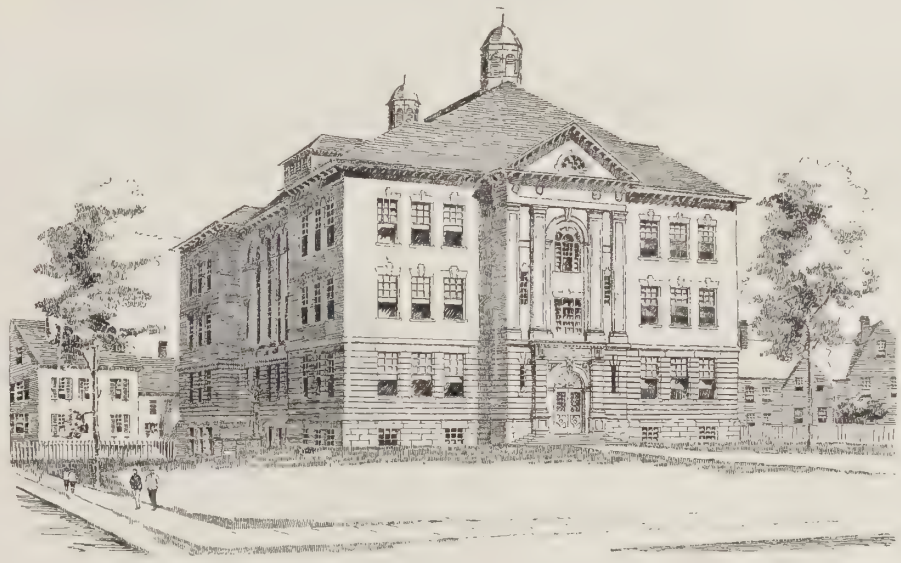
are meant wherever the word architect is used in these specifications.

SECT. 2. GENERAL DIRECTIONS.—(*a*) The contractor shall not assign or sublet the work unless with the consent of the architect in writing; he shall keep the control and charge of the work and of every part thereof, and give his personal supervision thereto; he shall keep a competent foreman always present when anything is being done on the work; and he shall allow all other persons doing work for the owner free access to, and not interfere with them in, their work.

(*b*) The building laws relating to buildings in said city, and all other regulations of law or public authorities, controlling or limiting the method or materials to be used, or the actions of those employed in doing the work, are to be carefully observed by the contractor, and all necessary permits are to be taken out, and all notices required are to be given by him. The contractor shall begin the work promptly and shall do the several portions thereof in the order designated in writing by the architect, but he is not to proceed with any portions of said work until so authorized in writing by the architect.

(*c*) The contractor shall follow figure dimensions in preference to scale dimensions in all plans and drawings, and in case of any discrepancy between the figures, or the figures and scale, or the drawings and specifications, the matter is to be submitted to the architect for adjustment, and any work done by the contractor before such adjustment is made shall, if the architect so requires, be replaced by work satisfactory to him.

(*d*) The contractor shall employ an engineer, competent and satisfactory to the architect, who shall lay out the work and shall establish all lines upon batter boards, and shall indicate grades: the contractor shall furnish substantial and convenient batter boards, shall maintain the same, shall have the lay-out tested from time to time by said engineer, and shall be responsible for all damage arising from any disturbance of the same.



NEW BROWN SCHOOL, HARTFORD, CONN.
Wm. C. Brocklesby, Architect.

(*e*) Full-sized detail drawings are to be furnished by the architect for such parts of the work as he shall desire; the contractor shall call for such drawings, and anything done relating to such parts, after such detail drawings are furnished, and not done in accordance with such drawings, is, if the architect so requires, to be replaced by work satisfactory to him.

(*f*) When for any reason the work is suspended, the contractor shall protect all the work, and the roadways and sidewalks shall be left by him unobstructed, and in a safe and satisfactory condition.

(*g*) The contractor shall keep himself fully informed as to the size, shape, and position of all openings and special accommodations required for heating and ventilating apparatus, plumbing, steam-pipes, tubing, wiring, boxing, and other things; and, in the absence of special drawings and information upon these several points, shall require and obtain such drawings or instructions before proceeding with any work which is affected by such requirements.

(*h*) The contractor will allow free use of his staging by other persons working upon the building.

SECT. 3. EXCAVATION.—Do all excavating required for the work covered by these specifications. Such excavated material as is suitable for refilling shall be used for this purpose; the contractor shall supply all additional material for same which may be required, as directed by the architect, and he shall remove from the site all unsuitable or unneeded material.

SECT. 4. PILE-DRIVING.—(*a*) Do all necessary boring and sounding, and keep a record of the movement of piles at each blow of the hammer for the inspection of the architect.

(*b*) Furnish and drive the piles as shown by plan; all to be driven to hard pan, to be good, sound, straight, spruce piles, not less than 10 ins. diameter where cut off for capping-stone, or 6 ins. at the bottom.

(*c*) If any pile is split or driven out of position, the contractor is to drive a new one to take its place.

(*d*) Cut the piles off at grade 5.

SECT. 5. FOUNDATIONS.—(*a*) Build the foundations of the height and thickness shown on drawings, starting same on granite levelers, of the dimensions shown by drawings, and 18 ins. in thickness; the whole foundation to be of even-split block granite the full thickness of the walls, the length of the blocks to be about one third more than the width, to give a good lap to the bond, laid in pure, fresh hydraulic cement, having good beds, builds, and faces, and laid solid, a true and even face showing on the inside, and also on the outside where exposed, all thoroughly pointed.

(*b*) Plaster wall below grade and above cellar bottom in Portland cement on outside of wall and give one thick coat of hot asphalt. (See Asphalt, section 12.)

(*c*) Bond all walls and angles thoroughly.

(*d*) Finish level and true on top, ready to receive the superstructure.

(*e*) Leave holes in walls for drain, gas, and water pipes, and for ducts where shown and directed.

SECT. 6. CUT GRANITE.—Furnish and set the granite work; to be of best quality [Blank] granite six-cut work; and to be as shown on general and detail drawings.

SECT. 7. BRICKWORK.—(*a*) No mason work is to be laid in freezing weather, except by written permission of the architect, and then only in accordance with such precautions as he may require.

(*b*) Construct all the brickwork indicated by the drawings, except where otherwise specified, of best quality hard-burned bricks, uniform in shape and size, and well wet, when necessary, before laying.

(*c*) Lay all door and window heads, jambs, arches, and stools in basement with round-cornered brick.

(*d*) Neatly rule all joints of exposed brickwork in basement.

(*e*) Bed each and every brick in mortar, under its bottom, sides, and ends, and bond the walls, unless otherwise specified, with course of full headers every eighth course, and lay in mortar as specified above.

(*f*) Set all the ironwork as called for by the plans and specifications; all plates to be set in cement mortar. Firmly bed and fill in around all beams, girders, etc.

(*g*) Point around all window and door frames with cotton and elastic cement; staff beads to be removed to do this work.

(*h*) All gas and electric pipes on plastered walls must be cut in to be flush.

(*i*) Fill up neatly all putlog holes, and clean down and point the entire work at completion, inside and out, where brickwork is exposed, using no acid stronger than vinegar, and oil with linseed oil, one coat, the exterior after the bricks have thoroughly dried from cleaning down.

(*j*) Carefully protect all work and leave the whole in a thoroughly clean and perfect condition at completion. Turn arches of required number of rings where iron beams or lintels are not called for.

(*k*) Furnish all wall ties and clamps not especially mentioned, but required by the building laws, of sizes and dimensions as directed by the architect, and build in all ironwork.

(*l*) Bed all wall plates in cement mortar on the walls.

[(*m*) Furnish and set molded brick where shown in accordance with detail drawings.]

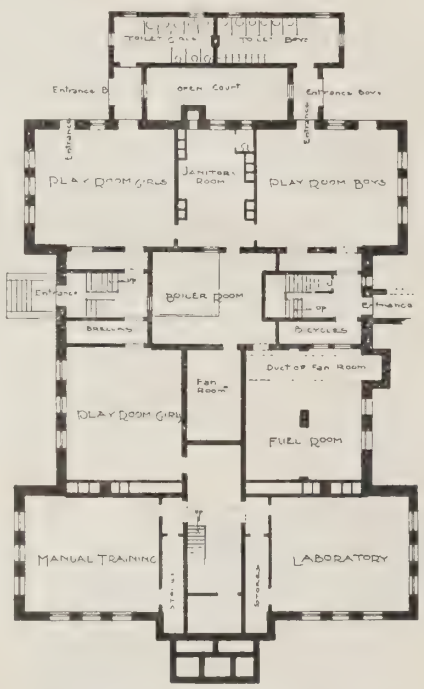
(*n*) Except where otherwise shown, the exterior brickwork is to be of selected Eastern water-struck brick, laid "Flemish" bond or as shown on general and detail contract drawings.

(*o*) Line the exterior walls, where plastered on inside. with hard-burned, hollow-clay brick 4 ins. thick, but all bonding brick and brick about door and window openings are to be solid hard-burned bricks as above .

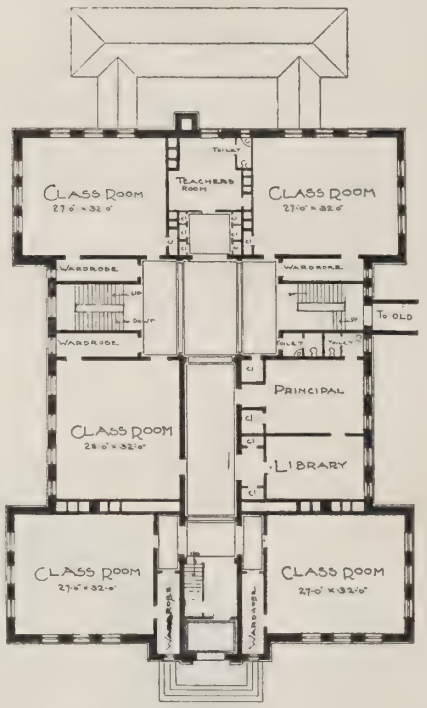
(*p*) Lay the whole with perfectly level, plumb, and true bond, rule neatly the joints of all exposed work, and give the rough brickwork of all exterior door and window jambs one thick coat of hot asphalt. (See Asphalt, section 12.)

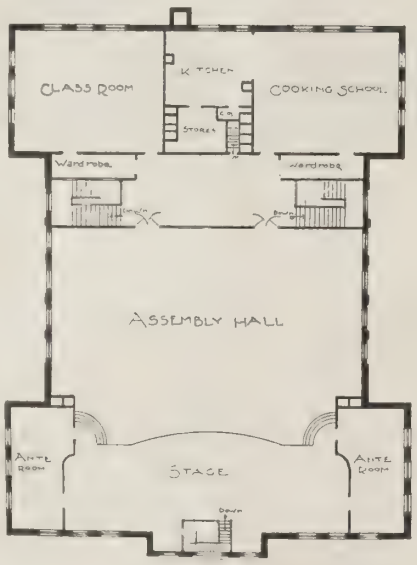
(*q*) Line the walls in basement with selected Eastern face brick, joints ruled for painting.

BASEMENT.

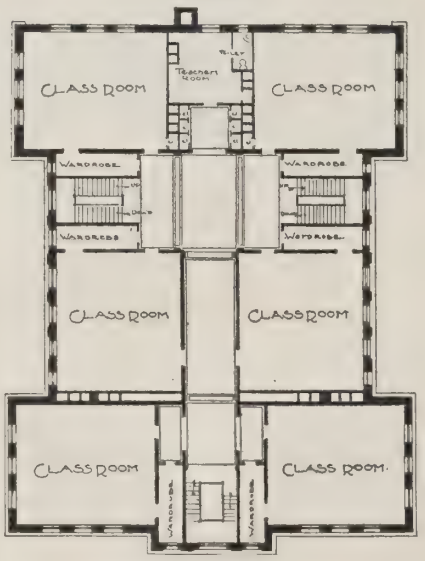


FIRST FLOOR.





THIRD FLOOR.



SECOND FLOOR.

NEW BROWN SCHOOL, HARTFORD, CONN.

(*r*) Pave bottom of trenches and conduits in basement with best quality hard paving brick laid in Portland cement mortar.

(*s*) Build trenches and conduits of 8 in. brick walls, laid in cement, for all pipes inside building and as shown on drawings; the outside of walls of these trenches to be plastered with Portland cement and then given two thick coats of hot asphalt. (See Asphalt, section 12.)

(*t*) Line with hard brick the sides of trenches and conduits for pipes.

SECT. 8. CONCRETING. — (*a*) Level off the basement bottom and fill in with clean gravel 12 ins. thick to the grade required, and settle and ram the same solidly for concrete.

Concrete 6 ins. thick throughout basement, with concrete composed of three parts of clean, coarse, washed gravel, and one part of cement, truly leveled, well smoothed off and left perfect at completion. [N. B.: This thickness of concrete is advised only for buildings built on "made ground"; elsewhere 3 in. concrete is sufficient and Rosendale cement is sufficiently strong.]

(*b*) Furnish and lay concrete foundations as shown on drawing in proportions of one, two, and four.

(*c*) Imbed all iron or steel work below grade in concrete as in (*b*).

(*d*) For concrete work required for fireproofing, see section 16.

SECT. 9. CEMENT. — (*a*) Portland cement shall be used for the concrete floor of basement, for concrete foundations, for pointing joints and plastering of face masonry, and for all brickwork below top of ground. American natural hydraulic cement shall be used in other parts of the work. The American cement shall be equal in quality to the best Rosendale cement, and the Portland cement equal in quality to the best imported Portland cement; both kinds shall be made by manufacturers of established reputation, and shall be fresh and very fine ground and put up in well-made casks.

(*b*) All the cement will be subject to inspection and rigorous test by the architect, and if found of improper quality will be branded, and must be immediately removed from the works; the character of the tests to be determined by the architect.

(*c*) The contractor shall at all times keep in store, at the site of the work, a sufficient quantity of the cements to allow ample time for the tests to be made without delay to thew ork of construction. The architect shall be notified at once of each delivery of cement. All cement shall be stored in a tight building, and each cask must be raised above the ground by blocking or otherwise.

SECT. 10. SAND. — The sand used to make mortar shall be clean and sharp, sufficiently coarse, free from loam and pebbles, and equal to the best Plum Island sand.

(*Continued.*)

Suburban Residence Built of Brick.

COST, TEN THOUSAND DOLLARS.

BY ALFRED B. HARLOW.

THE requirements for a suburban dwelling of moderate cost and extent, ever new and varied for each individual case and governed by varying conditions of exposure and contour of surface, present an every-day problem always of interest to the practising architect, but particularly engaging when he may from the beginning consider the house and its surroundings together, not merely as to the location of the cellar wall and its height above grade, but giving place to gardens, hedges, and walks as essential and important factors of an harmonious whole.

It seems as easy and quite more satisfactory to consider the walks and gardens along with house walls and rooms, and so study the whole plan rather than the house plan only; the walks expressive of entrances and halls, and beds and sodded areas standing for room space plotted out within. True, in execution they may not be seen together, but the influence of relationship will be felt and unconsciously recognized.

In the plan presented such a study has been made and a scheme indicated for an arrangement of plan and grounds in a simple and unpretentious way, well within the lines for a place of moderate cost and extent, and suggestive of a method of study that would result in harmony and individuality in the arrangement and composition of house and grounds, in place of ill-considered planting and approaches, arranged as best may be after the structure is completed, and so much in evidence in all suburban districts.

In the problem presented the conditions of grade are such as to involve a system of terracing, or a frank acceptance of the natural lay of the land with a more or less picturesque treatment of the architectural part of the problem.

As the latter method would give no level lawn spaces or garden spots,— so essential an adjunct to a suburban place,— I have adopted the wall and terrace treatment which could be economically carried out by bringing the earth to the front from the rear, and building necessary retaining walls of any local stone that would present an approximately even and formal surface. The house thus rests on a level plateau of which it becomes a part by the continuation of its lines in the architectural treatment of balustrade, steps, and walks, and its severity is relieved and interest added by dropping again to the natural grade on the front, the slope contrasting pleasantly with the level line of the balustrade capping the wall at the terrace.

The easy approach to the floor level of the house over the several groups of steps and level spaces, worked out with and required by natural conditions, would possess a charm and interest not to be acquired by straight and level approaches or forced and irregular pathways. The level of the terrace reached, the grass plots and walks behind the balusters suggest a desirable privacy, and the garden or porch is at hand on the left or the main entrance for the formal caller directly in front. A side path at the right leads from the natural street grade directly back to the kitchen, basement and kitchen gardens, and a gradually rising retaining wall following the lot line on this side gives a practically level walk to the rear.



FRONT ELEVATION.

On the left of the house the porch and sunken garden with its arbor shelter along the line of a high dividing wall afford seclusion and a restful spot not disturbed by adjacent property or the domestic machinery of the house, which goes on on the opposite side of the place.

At the rear of the house a series of terraces on the rising land may be arranged, occupied by kitchen gardens, tennis courts, etc., a small gateway through the hedge opening to a walk on the left, and the service walk continuing along the right side.

The walks may be a red brick for the approaches, or perhaps the very practical though less artistic artificial stone may be used for both steps and walks, with the garden walks of fine gravel.

Coming now to the material for such a house, and leaving out of account any question of a frame building, we naturally turn to brick

as the most satisfactory material within our means; and combining, as it does, an air of domesticity with good color and scale, it is on the whole the most satisfactory substance we could choose.

It is proposed that this house shall be built of brick of the simplest character, the plain gray-red stock brick laid with wide lime-mortar joints, making an unpretentious wall, but, with its varied and sparkling surface, a wall that is always good, that belongs to the vines that cover it, and the grass and shrubbery that grow up against it and make it a part of themselves.

The pressed brick in its varied shapes and colors finds a wide field in the requirements of formal town architecture, but in the country or for such a suburban dwelling as this article considers, its surface lacks the desired texture and touch of time that is found in the more modest but picturesque article proposed, and with the Flemish bond, which, of course, is used in laying our brick, we have already a smack of quaintness to our wall before the roof is on.

For the masonry details of the exterior terra-cotta is adopted as a mobile material of enduring qualities and slight expense. By its use we are enabled to adopt the decorative line of cornice topping out the wall, with its richly modeled egg and dart and modillion courses carrying the wide-spreading eave of light wooden beams, and to give a touch of refinement to corners and angles and window lintels by the introduction of ornamental detail.

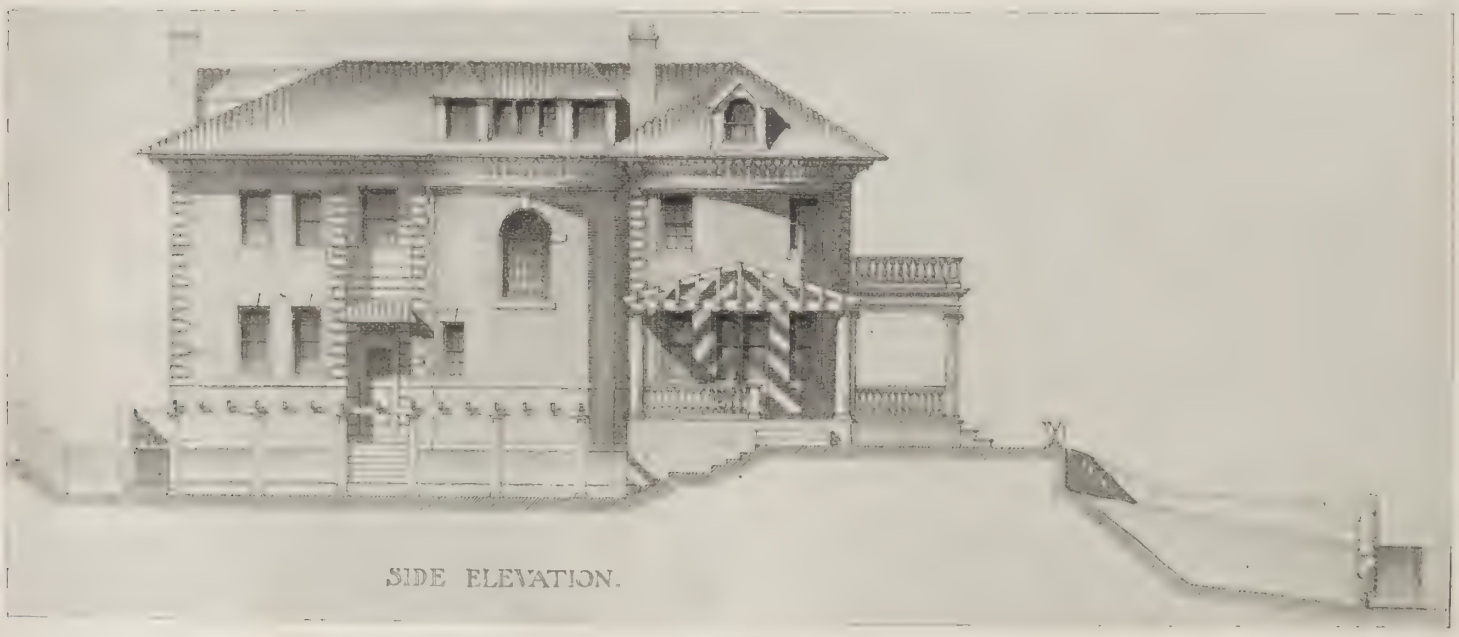
For the proper rendering of delicate detail the terra-cotta will be white, finished with a combed surface to keep in touch with the texture of the brick wall, to which it will also be related by the echo of its color in the woven lines of white joints. The gain in quiet and repose in a red and white combination of materials by the use of white mortar in the brick joints is surprising, the impression made being that of a white mass with the bricks imbedded in it rather than that of a red wall trimmed or outlined in its mass by white cornices and belt courses.

The porch at the end of the living room is shown with an open roof, suggestive of a pergola, a form easily covered with canvas for use in the summer, while in the winter it has the great advantage of allowing light and warmth free access to the windows behind it.

All porches, arbor, and balustrade to be wood, painted white to correspond with the terra-cotta in color without in any degree affecting it in substance and texture.

The color scheme is completed at the roof with tiles of brown shading to a suggestion of green, as a quiet topping out of the red house in its setting of grass and trees.

In the arrangement of plan the rooms have been so disposed as to gain the maximum of sunlight and air: the stairways and kitchen toward the north, the dining room properly accessible from the china closet and kitchen, and catching the morning sunlight, as it always should; the reception room having the morning as well as afternoon sun, and the living room receiving the whole afternoon and the sunset light. The most wholesome and desirable house is that receiving all the sunlight possible, and to so locate the rooms that they may receive the sun as nearly as possible in the order of their use from morning on through the day seems most desirable. The English fashion of a separate or detached staircase hall has many advantages, and the idea has been adopted here. The entrance hall of moderate size can be handsomely treated in wood, and it gives a long vista from end to end of the house and forms an attractive focal point, from which the rooms radiate, and which they directly adjoin as they cannot do in a small hall blocked with a staircase; neither is the attractive feature of a staircase lost, as it is seen from the main hall, out of which it directly opens. In itself, too, the staircase hall is an attractive feature opening on the axis of the dining room with its windows overlooking the garden, and its side entrance giving from the dining room directly to a raised terrace somewhat above the garden level, and on a path directly in the garden axis. The living room, which, with its porch, overlooks the garden, forms



SIDE ELEVATION.

with the latter the household suite during the summer time, and is well isolated at all seasons from the service portion of the house.

The second-floor plan provides four family bedrooms of good size, each getting a goodly portion of sunshine for a large part of the day.

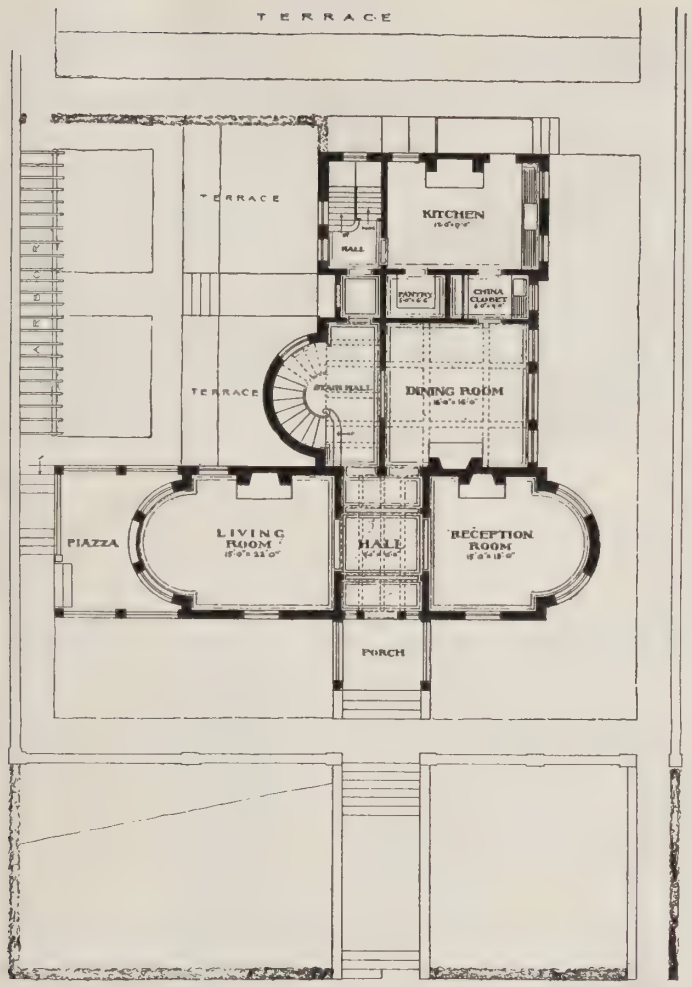
The bath room is accessible, and from the staircase arrangement is isolated from the lower hallway, a feature well worth striving for.

Servants are provided for in the roof story, a flat deck over the wide central portion giving space for two rooms.

In the basement there is space for laundry, servants' closet, furnace, storeroom, coal bins, etc., all well lighted from windows in walls across the front and on elevations not here shown, but which, from the fall in grade, will give light and air, and insure a dry, well-ventilated area under the entire building, with cement floors and lime-washed walls and ceilings.

The interior finish of our house must of necessity be plain and simple, nor is highly polished hard woodwork at all desirable here.

The hall and staircase and dining room may be of oak with the simple ceiling beams indicated, and each may be treated with a certain amount of paneled woodwork; the halls paneled to the height of the doors (the spaces are small) and the dining room wainscoted three or four feet high; the oak to be aged with acid stain, not filled, but finished with shellac and rubbed with wax. For the remainder of the house, painted finish with refined details gives



FIRST FLOOR AND GROUND PLAN.

elegance and home atmosphere in place of obtrusive and uncompromising polished wood.

The most satisfactory method of heating within reach is by means of a hot-air furnace with large pipes and registers to supply a goodly volume of warm air, rather than a smaller and more rapid delivery of intensely heated and frequently burnt air. No direct hot water or steam heating should be introduced in any part of a house other than in hallways, pantries, and perhaps bath rooms. A combination of direct and indirect steam or hot-water heating is most desirable, but involves an expenditure of too large a sum for a house of moderate cost. If care is taken to put in a furnace of large capacity that will do its work without forcing and scorching the air, a house may be kept at a comfortable temperature without difficulty. Every room in a house should have an open fireplace; not only is it a necessity in the cool of the spring and autumn before furnace fires are lighted, but in the winter a smoldering hearth fire helps out the furnace, and radiates cheery warmth and light, while the draught pulls air from the room, causing a correspondingly increased flow from the registers. Even where the fireplaces are not in use, the flue supplies an outlet for furnace-heated rooms and aids the draught from the registers, which cannot deliver air into a tightly closed apartment, thus insuring a circulation and constant change with a gratifying degree of purity. To insure success, careful attention should be given to the arrangement for supplying cold air to the furnace. If the air is brought directly to the heating surface by means of a cold-air box, the result when the wind blows into the duct will be quite different from the result when it blows from the opposite direction. In the one case, with a high wind it is difficult to supply enough warm air to the registers, as the damper of the box must be nearly closed or the air will be forced so rapidly over the dome of the heater that it does not become sufficiently heated; while in the other case, with a very cold wind blowing on the opposite side of the house, the pressure down the registers from that side has been known at times to actually create a back draught through the cold-air duct. The most satisfactory method is to bring the air into a small brick chamber, carrying it by a galvanized iron duct to the smoothly cemented floor, and on the opposite side place the furnace connection. Such an arrangement eliminates the factor of wind pressure as far as it is possible to do so and has shown most uniform results in actual experiment.

It is well to add a partition 2 or 3 ft. in height across the cold-air chamber to intercept dust and dirt. Such a chamber may be made 4 or 5 ft. square, with 4 in. brick walls extending from the cellar floor to the ceiling, with an air-tight door for access from the cellar. Although this is no new idea, it is an arrangement not often found in dwellings using a furnace, and seems worthy of mention from the success the writer has met with in its use.

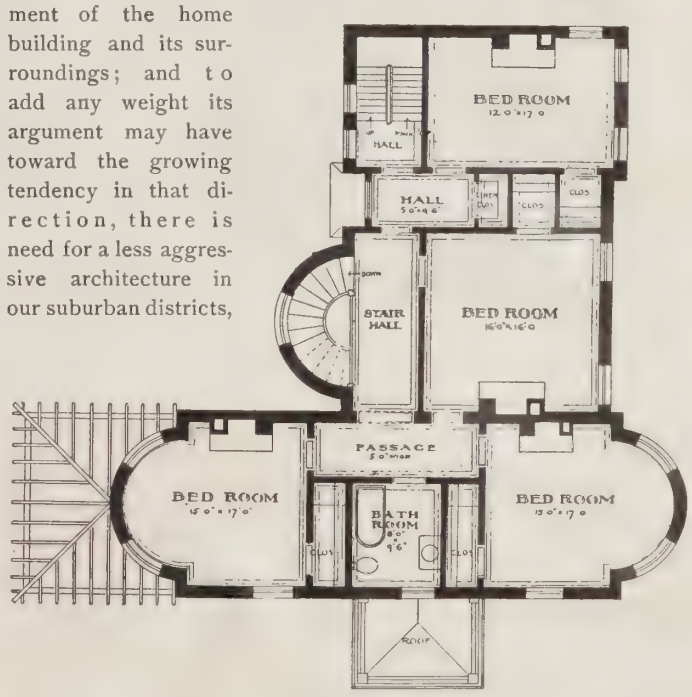
While not suggested as coming within the limits of the conditions of this article, a few words seem admissible here relating to the possibilities of solid floor construction even in houses of moderate outlay.

As the cost of rolled steel beams has been constantly decreasing, and will undoubtedly be quoted at still lower prices in the future, the comparatively small additional cost in masonry houses, of constructing the floors of the first and second stories of light steel beams and terra-cotta arches, renders the adoption of such a method perfectly feasible, and the gain in solidity, the absence of shrinking timber, and of resounding and springing floors, and the closing of air spaces to draughts and vermin, more than compensate for the additional expenditure, which would vary in different parts of the country, but at most should not exceed 5 per cent. of the cost of the house.

It will be seen on the accompanying plan that the substitution of brick for wood, in the single partition between the dining room and pantry, would give bearings for steel beams throughout.

There is little to be said about plumbing beyond the repetition of what has long been advocated and practised; the simplest possible arrangement of pipes open to inspection everywhere, the fewest possible fixtures, and the careful avoidance of all new and ingenious complications of traps and overflows for fixtures.

This article has been prepared in the interest of simplicity and refinement in the treatment of the home building and its surroundings; and to add any weight its argument may have toward the growing tendency in that direction, there is need for a less aggressive architecture in our suburban districts,



SECOND FLOOR PLAN.

that the house shall stand for that which is within, for the home which it covers, having no conscious air of wearing features whose only apparent purpose is that of attracting the notice of the passer-by.

Brick and Marble in the Middle Ages.

BY G. EDMUND STREET.

CHAPTER X.

"With all its sinful doings, I must say
That Italy's a pleasant place to me,
Who love to see the sun shine every day,
And vines (not nail'd to walls) from tree to tree
Festoon'd." —*Beppo.*

Venice to Verona — Verona to Mantua — Villa Franca — Mantua: its Churches and Palaces — The Theatre — Montenara — Campitello — Casalmaggiore — Longadore — Cremona: the Cathedral — Churches and Public Buildings — Lodi — Pavia: its Churches — Castle of the Visconti — The Certosa — Drive to Milan.

OUR gondolier, anxious not to be too late for us in the morning, slept in his gondola beneath our windows, and did his best, when the sun rose, to rouse the sleepy porter of our hotel, but in vain; and at last, when I awoke, I found we should have a very narrow escape, if indeed we did not absolutely lose our train. The thing was, however, to be done, and was done. We shot rapidly — only too rapidly for the last time — along the smooth waters on which we had been so pleasantly loitering before, and soon found ourselves at the railway station. Our journey was much like what such journeys usually are: as far as Verona we were only retracing our steps, but now the hot sun had quite cleared away the clouds which, when we passed before, hid the Tyrolese Alps from our sight, and these, whenever the high acacia hedges which line the railway allowed us a sight of them, made the journey so far beautiful.

The names of the engines on this railway are very unlike the kind of nomenclature indulged in at home; we were drawn to Verona, I believe, by the Titian, and saw, as we rushed along, engines named after Dante, Sansovino, and other artistic and literary celebrities.

We reached Verona at ten o'clock; the station, however, is so much out of the town, and the day was so intensely hot, that we gave up the idea of again going into it, and, contenting ourselves with the general view of its quaint and picturesque walls rising over the rugged hills which girt the city on its northern side, we sat down to a breakfast of iced lemonade and some of those deliciously light cakes which are never had in such perfection as in Italy, and amused ourselves by watching the way in which the guards and drivers of the train by which we had travelled proceeded to solace themselves with a game at billiards, upon a table provided, I suppose, by the very considerate directors of the railway company.

The railway from Verona to Mantua crosses a country which is thoroughly uninteresting in point of scenery; it carried us on well into the great plain of Lombardy, rich, teemingly rich, in its produce, but flat, arid, and sultry to a degree. This was altogether one of our hottest days, and took us fairly into a kind of district in which the heat is most oppressively felt.

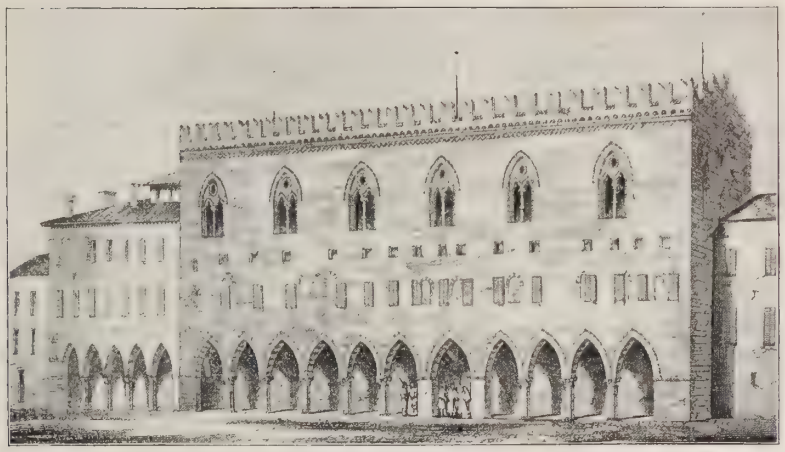
On the road we passed Villa Franca, a small town which has a rather striking castle, with battlemented walls and a good many square towers, still very fairly perfect; the whole built in brick, and with battlements finished square at the top, and not forked like those at Verona.



ST. ZENO, VERONA.

We reached the station at Mantua by twelve o'clock, but, as this was very far from the city, it was nearly an hour later before we were fairly landed at one — I forget which — of the abominably dirty and bad inns to which sojourners within its walls have to submit with the best grace that they can.

Mantua is nearly surrounded by water; two large shallow and unwholesome-looking lakes giving it this far from pleasant kind of isolation. Over a long mediæval bridge between these waters the way into the city from the terminus lies. One of the lakes is higher than the other, and accordingly twelve mills, each adorned with a statue of an apostle, are formed upon the bridge, and give it its name of Ponte Mulina.



DUCAL PALACE, MANTUA.

The general aspect of Mantua is very dreary and unpleasing, not less forlorn in its appearance than Padua, and possessing but little attraction for an architect. The chief architectural feature of the city is the Ducal Palace, which contains, in the midst of a mass of Renaissance work of the poorest and most unsatisfactory kind, some very good remains of pointed architecture.

The finest portion is a long building of vast height, and retaining more or less of Gothic work throughout, but especially remarkable for the range of windows in its upper stage. Its front faces on one side towards the Piazza di San Pietro, and on the other with a very nearly similar elevation towards the Piazza del Pallone, one of the courts in the vast palace of the Gonzagas, of which it forms a part. This building is said to have been commenced about A. D. 1302 by Guido Buonacolsi, surnamed Bottigella, third sovereign of Mantua, and this date quite agrees with the character of all the detail. The interior has been completely modernized, mainly by Giulio Romano, who carried out very extensive works in other parts of the palace. The windows in the upper stage of this portion of the palace deserve notice as being about the most exquisite examples of their class that I anywhere met with, though those in the campanile of Sant' Andrea, hard by, are only second to them. The main arch is of pure pointed form, and executed in brick with occasional voussoirs of stone — one of which forms a key-stone — and over it there is a label of brick effectively notched into a kind of nail-head. The same kind of label is carried round the arches of the window-openings, and down the jamb as a portion of the jamb-mould, and again round a pierced and cusped circle of brick in the tympanum. In the sub-arches the key-stones and cusps are formed of stone. The whole of the jambs are of brick, but instead of a monial there is a circular stone shaft, with square capital and band and base. The whole is so exceedingly simple as to be constructed with ease of ordinary materials, and it is quite equal in effect to any stone window of the same size that I have ever seen.

The accompanying drawings will, I trust, sufficiently explain the merit of this magnificent piece of brickwork. The arcading upon which it rests, and the perfectly unbroken face of the whole, are very characteristic of Italian work.

On the opposite side of the Piazza di San Pietro is the cathedral, the only ancient portion of which is a small part of the south aisle. It is of very elaborate character, entirely built in brick, and so far as it remains appears to have been part of an aisle finished with a succession of gables, one to each bay, a common arrangement in German and French churches, where additional aisles are so frequently met with, but uncommon in Italy, where, as in England, churches have seldom more than one aisle on either side of the nave.[1] The brickwork in this small fragment of the cathedral, though elaborate, was not pleasing, being of rather late date.



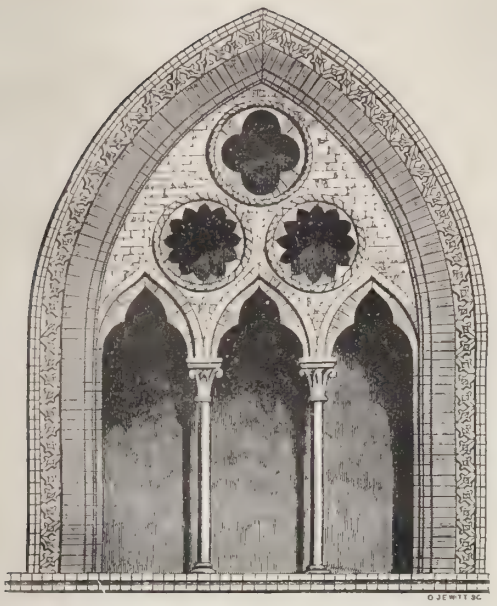
WINDOW IN DUCAL PALACE, MANTUA.

On the same side of the Piazza as the cathedral is the Vescovato, a large pile of ancient building, but very much modernized. There still remain, however, some good three-light windows in the upper stage, inclosed within a circular arch, without tracery, and divided by marble shafts. Some old arches remain also in the lowest stage, which, though now built up, are still valuable as examples of the best mode of treating brickwork. They consist of three orders — the two inner formed of alternate voussoirs of brick and stone, carefully and regularly counterchanged, and the outer of a moulded terra-cotta ornament. Between each of these lines a brick of deep red colour is set edgeways, shewing a dark line of little more than an inch and a half in width, and valuable as very clearly defining the lines of the arch. All these courses are on the same plane; and probably another rim of the arch is concealed by the walling which has been filled in underneath.



CASTELLO DI CORTE, MANTUA.

[1] It is to be seen, however, in the church of San Petronio, Bologna.



BRICK WINDOW, SANT' ANDREA, MANTUA.

Going on from the Piazza San Pietro, and passing under an archway, we came upon the Castello di Corte, also a part of the ancient palace of the Gonzaga family, who were for a long time lords of Mantua. It is certainly a very remarkable piece of mediæval fortification, but its effect is much damaged by the erection of walls between the battlements, which in my view I have thought it much better to shew in their original state, which is evident enough upon careful inspection. The heavy machicolations which run round the main building have a peculiar and rather grand effect, particularly in the flanking towers. This portion of the palace is said to have been erected just at the close of the fourteenth century.

Close to the Castello di Corte is the Ponte di San Giorgio, one of the entrances to the city, and built between the Lago di Mezzo and the Lago Inferiore.

Retracing our steps, we soon found ourselves at the great Palazzo della Ragione, or town-hall. It has been very much altered, but one gateway remains in a very perfect state, and is quite worthy of illustration. The marble shafts in the upper stage of the building are coupled one behind the other with very beautiful effect. Brick and stone are used alternately in the main arch of this gateway, with thin dividing lines of brick, as in the Vescovato. In a wall close to the gate is a sitting figure, intended, it is said, to represent Virgil, of whom the Mantuans are still, as in duty bound, very proud. I cannot say much for the figure or its canopy, both of which are, however, mediæval.

We found nothing else worthy of notice in this building; but close to it stands the church of Sant' Andrea, a hideous Renaissance edifice tacked on to a most beautiful brick campanile.

The detail of this is throughout very fine. The tracery is all of a kind of plate-tracery, consisting, that is to say, of cusped circles pierced in a tympanum within an inclosing arch; the shafts between the lights are of polished marble, and coupled one behind the other. The relative proportion of the cusps in this and in most other Italian buildings is very good. In trefoils, for instance, the upper cusp is usually smaller than the lower; and in all good cusping it must be so. Modern men generally reverse the order, and, at the present day, so little is the subject really understood that at least ninety-nine out of every hundred cusped window-openings are designed without feeling, and quite unlike the best old examples; and this, though apparently a point of very small importance, is really of great consequence to the perfection of any pointed work.



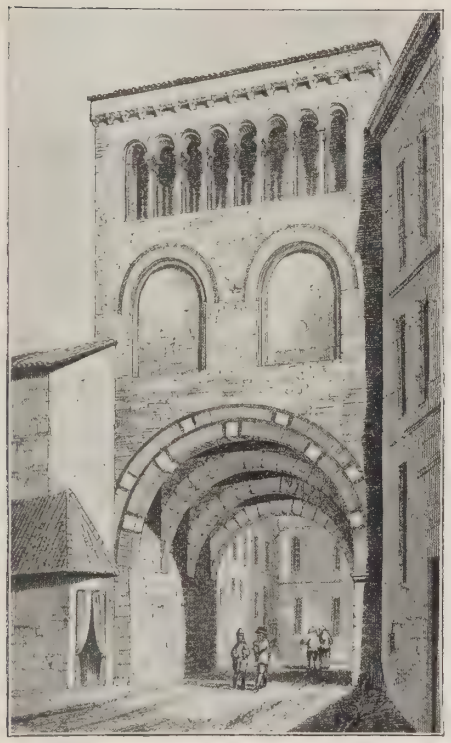
BRICK WINDOW, SANT' ANDREA, MANTUA.

The faulty portions of this campanile are the elaborate arcadings in brick beneath the string-courses, and the awkward and abrupt manner in which the octagonal stage and the round tile spire are set upon the square tower. The present appreciation of the building by the good people of Mantua is shewn by the opening pierced in its lower stage, in front of which the modestly withdrawn folds of a green curtain disclose the interior devoted to a barber's shop, and in which the patient, seated in the middle of the shop, and looking into the Piazza, submits to the painful operation of shaving — a common picture in almost every street of an Italian town, but not pleasant when the place is a portion of a church.

The guide-books speak of the church of Sant' Andrea as "among the finest existing specimens of an interior in the revived Roman style." If it really is so, I advise all architects interested in the failure of the said style to venture, notwithstanding the forbidding west front, into the nave, when they will perhaps find comfort in seeing how miserable a building "one of the finest" of



CHURCH OF SANT' ANDREA, MANTUA.



GATEWAY, PALAZZO DELLA RAGIONE, MANTUA.

its class may nevertheless be !

The people at Mantua seemed to be excessively disturbed by my attempts at sketching, and at Sant' Andrea they mobbed me so thoroughly that I was really beginning to think of giving up the attempt in despair, when a kindly-disposed hatmaker, seeing my distress, came down to the rescue, and gave me and my party seats in a balcony on the first floor of his house, in which, sitting at my ease above my persecutors and listening to the good man's wife and daughters, I finished my sketch with great comfort.

In Mantua there are two or three other churches with brick campanili, but they are very inferior in their character to that of Sant' Andrea, and hardly worth special notice. We owe it to the French that there are not more interesting churches, for, having succeeded in capturing the city after a very prolonged siege, they sacked it, and are said to have destroyed no less than about fifty of them.

Here, as elsewhere in this part of Italy, most of the streets are arcaded on either side, affording pleasant shelter from the hot sun, but every twenty yards we come upon one of an unpleasant class of shops, in which cheese, oil, and the like comestibles are sold, with most objectionable effects on all people blessed with noses.

In the evening we found an Italian performance going on at the theatre, and so thither we went, anxious to see how far Italian comedy might be amusing. I fear our inquiry was not much to our edification, for the favourite performers were mainly remarkable for the prodigious rapidity with which they uttered their facetious sayings, and so we lost more than half the dialogue. The theatre was almost entirely filled with Austrians, but still there was a sprinkling of Italians among them, which did away with the absurdly martial appearance of the only other theatre we had been into — that at Verona.

The next day was Sunday, but we were obliged to push on ; and so, resigning ourselves to the diligence which left Mantua at about nine, we booked ourselves for Cremona, under the promise that we should be delivered there punctually by five o'clock.

We lost sight of Mantua almost immediately, for, travelling along a dead flat and by roads whose sides are lined with high hedges of acacia or orchards thickly planted, you never see any place or building until you have absolutely arrived at it. There was not much to interest me on the road, and the weather, at first cloudy only and sultry, gradually became worse, and, before we had gone far, settled into a steady pouring rain ; so we read, wrote, and occupied the many hours in the rumbling diligence as best we might.

At Montenara, which we passed on our road, the church has a brick campanile, with pilasters at the angles, and in the belfry two-light windows, with marble central shafts and round arches. It has one of the usual brick conical spires, with small angle-pinnacles — a finish to these campanili which certainly does not improve upon acquaintance. They are constructed of bricks with semicircular ends laid side by side, the joints being broken in each course, and so making a very jagged kind of cone.

The only noticeable point about the church at Montenara is that it has been lately rebuilt in the very worst taste, and at an angle of forty-five degrees with the old steeple !



BRICK WINDOW, CAMPITELLO.

At Campitello there are several remains of interest. There is a small domestic building, with four pointed windows of two lights at the side ; the windows have central shafts of stone, but are otherwise entirely of rough brickwork. The church has a kind of double belfry-stage, arcaded similarly in each stage with round arches. There are also here the remains of a castle by the river, with a fine tower of the same type as the angle-towers of the Castello di Corte at Mantua, and covered with a very flat-pitched roof.

At Casalmaggiore, a town of some importance on the Po, we stopped for dinner ; but it was too wet to attempt to look at the river, and the only note I made was of a large new church now in course of erection, Renaissance in style, and with a large dome, and a choir and transepts, all terminated with circular ends. The redeeming feature about it was that it was entirely constructed in brick with considerable care, though probably ere long this will be covered with a coat of plaster, of which modern Italians are not one whit less enamoured than are modern Englishmen.

At a village, the name of which I did not learn, between Casalmaggiore and Cremona, the church had a remarkably good simple brick campanile. The belfry windows were pointed, of two lights, with a small pierced circle in the head, the shafts being of stone of course. Beneath the string-courses there was arcading, and the tower was finished with three forked battlements of the Veronese type on each face, and behind these rose a circular brick spire. This tower was to the south-east of the church.



BRICK WINDOW, NEAR CASALMAGGIORE.

At Longadore we saw another church with a good early campanile, of which I made a sketch. This was Romanesque, with angle pilasters, and a central pilaster carried up as high as the belfry-stage. The belfry windows were of three lights and shafted. The battlement was most peculiar — a quarter circle at each angle and a half circle in the centre of each side, with a narrow space between them ; the whole executed in brick and covered in with a flat modern roof. The angle pilasters finished under arcaded string-courses. Generally speaking, in these churches the only ancient features seem to be the campanili, and these are always of brick and nearly similar in their general design, with pilasters at the angles, a succession of string-courses — generally arcaded underneath — and windows in the belfry-stage only.

It was quite six by the time we reached Cremona, and, depositing our passports at the gate, we trotted on along the smooth granite (which in these towns is always laid in strips between the rough ordinary paving for the wheels to travel on), and after traversing a long tortuous street, and getting a glimpse only of the cathedral as we passed near its east end, we were soon deposited at the Albergo del Capello, a comfortable hostelry, which we enjoyed the more by contrast with the miserable quarters with which we had to put up at Mantua.

(*Continued.*)

Fire-proofing.

RECENT IMPROVEMENTS IN THE MANUFACTURE OF FIRE-PROOF BUILDING MATERIALS FROM CLAY.

IN THE BRICKBUILDER for June, 1897, while commenting on the effects of fire and water on the fire-proof Horne Office Building at Pittsburgh, on May 3 of that year, the following sentences ap-

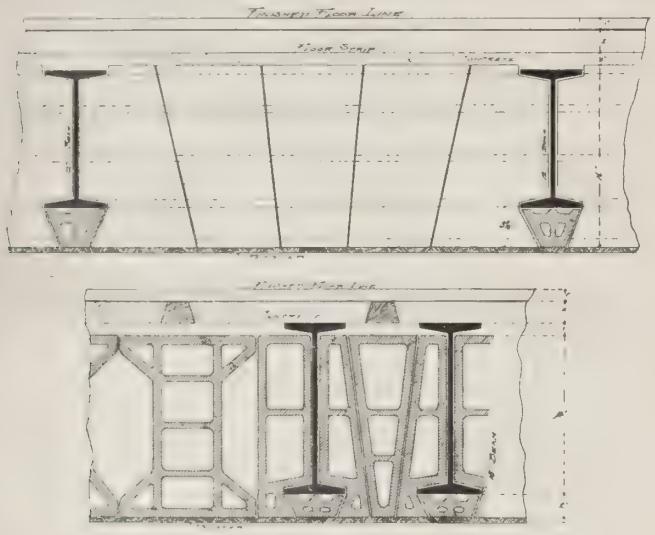


FIG. 1.

peared: "The fire-proofing material throughout is semi-porous red clay hollow tiles." "The fire test in the building showed that heating, wetting, and cooling did not destroy the structure of the material, as is sometimes the case with very light porous terra-cotta made of plastic fire clays." "The value of semi-porous tiles was completely demonstrated in this fire." And in August of the same year THE BRICKBUILDER said, in an article on "The Details of Fire-proof Construction": "The use of porous, and not semi-porous, terra-cotta is recommended for inert or protecting material, when used solid, while the semi-porous terra-cotta is recommended when used in the hollow form." Later, in the November issue, in an article on "The Present Condition of the Art of Fire-proofing," the value of a method for finishing the ceilings of fire-proof buildings with independent flat tiles, and the fact (which has been repeatedly demonstrated by experience) that if such tiles were made by splitting hollow tiles, after burning, they would not crack when exposed to fire and water, were set forth at considerable length.

Since then, THE BRICKBUILDER has anxiously watched to see if any advantage would be taken of these suggestions, and the result

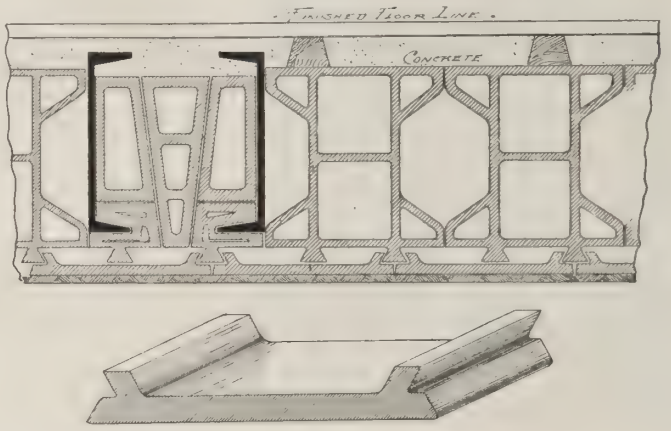


FIG. 2.

in one instance is highly gratifying. Upon inquiry it was found that the Pioneer Fire-proof Construction Company, of Chicago, had since then not only experimented with, but put in practise, some of the recommendations of THE BRICKBUILDER. We therefore sought an interview with Charles F. Eiker, the general manager of the company, who has prepared the accompanying illustrations, which, to a certain extent, furnish replies to some of the questions addressed to architects in Chicago, as given in our August and September issues.

In answer to an inquiry as to what had been their practise in preparing and mixing clays, Mr. Eiker said: "Up to five years ago we used only the crude clay as it came from our mines, which was ground in dry pans tempered with water and put through our presses ready to dry and burn. If we used any grog, which, as you know, is rejected tile ground to a powder, it was without any system, and most of our rubbish pile was used for filling in low ground. I need not add that, according to this way of doing things, the quantity of imperfect material that could not be used commercially and went to the dump was very large. We have since then improved the hard product by a more systematic use of grog, have thereby decreased the waste, and have found this to be more economical in the long run.

"In 1893 we commenced experimenting with sawdust and ground coke for the purpose of making our material more porous and less brittle. We knew that our fire clay, which is very 'short,' would not make what is called porous terra-cotta. Since the great fire in Pittsburgh, in May, 1897, and after reading your comments upon it, we became convinced that the best material for all purposes was semi-porous terra-cotta, and renewing our experiments, we set about to make it as perfect as possible with the materials at our command. The result is that we are now making and using it in our contracts.

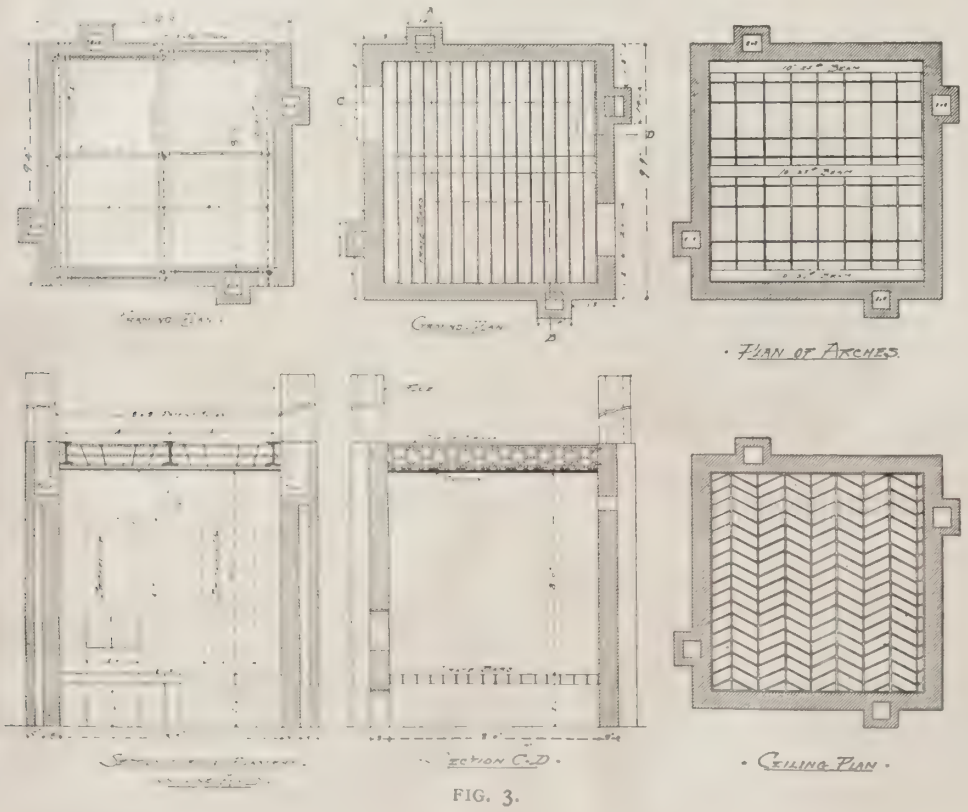


FIG. 3.



FIG. 4.

We use our fire clay finely ground in dry pans as a basis. With this we mix a small amount of ground shale to make it plastic, a proportion of grog to make it burn true and straight without cracks, and pulverized bituminous coal. We had to abandon both sawdust and coke. Of course the proportions in which we use these materials are our own property, and would not apply to any other clay. Our composition is the result of numerous experiments, for conducting which we constructed a small experiment kiln. We formerly made the hard tile as thin as it was possible to run it from the dies and burn and transport it successfully. It was necessary to do this to meet competition, reduce freights and handling, and to comply with the demand of the architects for a light material to be used in high buildings. Now that we are able to make the body of the material lighter, we have increased the thickness of the walls of the tiles about 25 per cent. to insure greater toughness and strength. We, as well as the architects, once thought that thin walls were best in hard tile, because the heat-resisting quality was found in the air cells. But the new material is also more nonconducting, and there is not only no objection but a great advantage in making the walls thicker, as you have already suggested. We still keep down the cost of transportation as well as the weight."

Q. "What is the relative expense of the new material compared with the old?"

A. "It is slightly greater. The cost of the materials used and the labor employed are considerably more; but there is a reduction in fuel, and the very slight loss from imperfect material offsets this to a considerable extent. Instead of having great piles of useless material, we have just enough now to grind up for 'grog.'"

Q. "How are you satisfied that this material is better than the old?"

A. "We have built a test house at our works at Ottawa, and have subjected it to repeated tests to demonstrate its value under the conditions which demonstrated the weak points in hard-tile constructions as developed in recent fires in fire-proof buildings."

Q. "Has this material been used in buildings during the past year, and if so, where, as we want to observe the results in case any of them should be subjected to an actual test?"

A. "It has been used in the State Street addition to the Fair Building, the addition to the New York Life Building, the Carter Building, and the Strong Building, all in Chicago. We use the same material for all purposes, and do not confine it to floor arches."

The illustration here given (Fig. 1) shows two vertical sections of the latest pattern of end-pressure floor arches made by the Pioneer Company. The upper one is a section through the beams, and the lower one a section through the girder. It is intended for a construction of double 15 in. I beam girders set far enough apart to pass outside of the continuous steel columns. The 12 in. I beams are framed to the sides of the girders, without necessitating any coping of their flanges. The arches are 16 ins. deep, and the under side, forming a flush ceiling, is 3½ ins. below the beams and 2 ins. below the girders. This provides for a soffit tile under all beams and girders that can be made with two air spaces. Only two buildings have been heretofore erected in Chicago with 3 in. hollow soffit tiles under the beams: the Western Union Telegraph Building and a wholesale store on Fifth Avenue. The girder, according to this construction, is treated similarly to those of the New York Life Building, as already described in THE BRICKBUILDER for July, the protection being independent of the floor construction, though both are flush at the bottom. The floor arches are built entirely of tiles of one section, including the skew-backs, and cut so as to occupy their respective positions, the joints radiating from a common center. Mr. Eiker says that this arch can be safely set, for office buildings or retail stores, to a safe span of 10 ft. No concrete is used except as ballast for the floor sleepers. Being made of semi-porous tile, the walls are made 1 in. thick. Attention is called to the fact that in these sections of tiles there are no sharp angles on the inside of the cells, which are the points at which arch tiles have been most liable to crack. The angles are rounded, with a radius of about ½ in., which Mr. Eiker claims as the result of tests showing that tiles of this section can be successfully dried and burned. This illustration (Fig. 1) is taken from the detail drawings of the floor construction of an important building now under consideration.

Fig. 2 is a section taken across the girder of a floor construction parallel with the beams, and adapted to the form of steel work used in the New York Life Building (see July BRICKBUILDER). It shows how the system of ceiling protection suggested in THE BRICKBUILDER for November, 1897, can be applied to flat end-pressure arches.



FIG. 5.

The Pioneer Company has constructed a section of floor and ceiling according to this detail in their test house at Ottawa, Ill., and subjected it to a very severe private test for their own satisfaction. The tiles forming the arches are run with two projecting dovetails on the bottom of each. The alternate dovetails are used for securing ceiling tiles which have been burned in couples and split apart. One of these is shown enlarged under the section drawing (Fig. 2). They are cut off diagonally so as to have a lozenge shape. This makes it possible to insert them between the dovetails with a small amount of mortar on each edge. These tiles when plastered are subjected to the full effect of fire and water, and have an air space behind them for the protection of the bottom of the arch. If they should fall in case of an actual test they can be easily and cheaply replaced, which would not be the case if the bottoms of the arch tiles should be cracked off. Thus the use of them avoids the necessity for resetting any of the arches. It has been demonstrated repeatedly, as described in these pages, that such flat tiles will resist fire and water better than hollow tiles. The Pioneer Company claims to have proved it, as will be seen hereafter.

To make this plain, we reproduce the drawings of their test house, with such a construction in position, which are shown in Fig. 3. This has many interesting features which seem to make it superior to that used by the New York Department of Buildings. The drawings are in the main self-explanatory. The "Plan of Arches" shows where the joints of the end-pressure arches are seen from the top, while the "Ceiling Plan" shows the ceiling tiles in position under the arches. A further description of this house and the test of tile-protected arches will be given in Mr. Eiker's own words: —

"The test house is very similar to that which was constructed two years ago by the New York Department of Buildings to determine the relative values of fire-resisting systems of floor construction used in that city. We think we have improved on that one by the introduction of two additional flues. Engineers of reputation have advised us that this is the only way to get a proper and uniform fire test. The building was completed Dec. 15, 1897, and the test of the protected flat-arch system was made in the latter part of December. The flat arches and furring tiles on the ceiling were set as shown on the drawings, and as I have described to you, all having been made from special dies made for the purpose, and the side walls were furred with 1½ in. split tile, all the material being our semi-porous terra-cotta. The upper surface of the arches was covered with wooden sleepers ballasted with concrete and covered with such a wooden floor as is generally used in office buildings. There were four 'peep holes.' Opposite one of them, on a shelf made of cast iron, were placed a piece of glass, a piece of brass, and another of copper. Each of these was melted in turn as the required temperature was reached. The fire was continued until the cast-iron shelf melted, when the 4 ins. of brickwork over the two fire doors was torn down. A 1 in. stream of cold water at a pressure of 50 lbs. to the square inch was thrown in until the whole was cooled sufficient for examination. I do not claim that this was such a test as scientific men might have made, but it suited us. The result showed that no wall furring had been broken or dislodged, and only three pieces of ceiling tile fell. They were immediately in range of the stream of water, and it appeared as if the joints had first been washed out and the tiles pushed away by the force of water. They were picked up unbroken. The photograph that I have shown you (Fig. 4) was taken after the test; the other one (Fig. 5) shows the outside of the test house. This building is still standing and will be used whenever we have occasion to make tests for ourselves or put to the service of any one who may desire to do so, to find if any new facts can be discovered."

In answer to a question, Mr. Eiker said that the fuel used was dry pine wood only. It was replenished through the two low iron doors, one of which is shown in Fig. 5. Over each of these was a sheet of iron with 4 ins. of brickwork built outside of it and so fixed that by pulling the sheet the whole would fall at once. The fire was maintained from 11 A. M. to 3 P. M. for this particular test.

Masons' Department.

SOME MISTAKES OF CONTRACTORS AS VIEWED BY AN ARCHITECT.

BY F. E. KIDDER.

IN the nature of things, there will always be a difference of opinion as to the wisest manner of conducting a given business and the methods to be pursued to gain the desired end. There are, also, and the writer deems it a misfortune, different ideas as to what constitutes success in business, although most people will agree that a certain amount of financial gain must be produced before one can call himself successful as a business man.

Assuming that a successful contractor is one who so conducts his business as to provide a comfortable living for himself and family, and to increase to a reasonable degree his original capital of goods and money, and to a large degree his reputation for good work and satisfactory execution of his contracts, the writer proposes to speak of a few of the things done, or neglected, by building contractors which appear to be in the nature of mistakes, that might to a large extent be avoided.

The first of these, both in point of order and in the consequences to the contractor, is that of *bidding too low*. It is certainly the opinion of most architects that contractors make a very serious mistake when they submit a bid that will not enable them to come out "whole" under any contingency, or with probable conditions allow a reasonable profit. The greater the risk, the greater also should be the margin allowed for profit.

Many contractors appear to think that they are doing the architect a favor when they put in a low bid, and although this may be so in special cases, it certainly is not so in the general run of work; and whether it be so or not, it is not the duty of the contractor to look out for the interests of the architect, in this particular, at least. As a rule, owners will finally either pay a reasonable price for what they want, or will take what they can get for their money, and that they should do so is beyond question.

To submit a low bid to help out the architect, and then expect him to "let up" on the work, is not only a great mistake, for which one deserves to lose, but verges on dishonesty.

That contractors, as a body, recognize the great evil of low bidding and have tried in various ways to prevent it is well known, but, as a rule, the schemes that have thus far been tried have not proved successful. The writer doubts if any scheme of prevention will ever be successful for any length of time, and believes that the only effective remedy is for each contractor to recognize that he is injuring himself when he puts in a low bid.

That contractors also make a mistake in bidding too high is also true, but this is a mistake that seldom occurs except in individual cases. A mistake frequently made by ignorant or careless contractors is that of making their bid according to the figures, either real or alleged, of some other contractor, and in connection with it is, perhaps, the greatest mistake of all: that of not recognizing one's own ability, and attempting a business for which one is not equipped, either mentally or with experience or capital.

The writer has known of many cases where a contractor has learned that another contractor has offered to do a piece of work for a certain sum, and has then put in a bid a little lower, without really knowing whether the work could be done for that amount or not. In not a few cases misleading bids have been quoted, and the contractor using them has been badly "stuck." A person that cannot estimate with reasonable accuracy the probable cost of work indicated by proper plans and specifications certainly cannot expect to become a successful contractor, although he may be a good workman.

Herein lies also a common mistake of foremen, or those who expect some day to enter the ranks of contractors, viz., that they neglect to observe carefully the cost of doing different kinds of work, the labor and materials required, and of making proper records of the same for future use.

When it comes to filling out and signing the contracts, the contractor not infrequently accepts conditions that he knows or ought to know will impose a hardship upon him, and in some instances, if strictly enforced, may cause him a considerable loss.

Until a contract is signed, it may be changed or modified, but after the signatures are affixed it can only be modified by the consent of both parties, and by that of the surety, if there is one.

The particular conditions of a building contract that may not be fair to the contractor are those relating to the payments and to the time allowed for completing the work.

A contractor cannot be expected to sign a contract unless the terms of payment are satisfactory, although it is fair to presume that he will be satisfied with the usual conditions of such agreements. Not infrequently, however, an owner will endeavor to hold back an unduly large percentage of the contract price until some time after the work is completed and accepted.

If the contractor has sufficient capital or credit to carry on the work under these conditions, it may pay him to accept them; but if he has not, and cannot pay his bills promptly with the amount of money coming to him, he should say so, and insist on better terms, and in most cases they would be granted.

The owner is usually as anxious to accept the lowest bid as the contractor is to do the work, and the latter should not be afraid to insist on terms as favorable to himself as to the owner. The same is also true in regard to the matter of time. Contractors undoubtedly know that it is hard to make a forfeiture clause "stick," but it is sometimes enforced, and the writer believes that it is a decided mistake to go on the principle that it will be "got around" some way.

It is much better to insist on the time necessary to do the work, with proper allowance for bad weather, delays, etc.

Again, many contractors expect the architect to see that their interests are looked after in drawing up the terms of the contract. Reliance on this is not always safe, nor is it quite fair to the architect. Until the contract is signed the architect bears much the same relation to the owner that a lawyer does to his client, and no one would expect a lawyer to advise the other side.

The contractor, therefore, should look out for his own interests, even at the expense, if necessary, of consulting an attorney, and he should be sure of what is in the contract before he signs it.

The writer has known of several instances in which contractors have bound themselves to do more than they intended, through carelessness in reading the contract or specifications, which are considered as a part of the contract. After the contract is signed and the work commenced, the relation of the architect changes somewhat, being more that of a judge between both parties, but he is also to a certain extent the agent of the owner; and as the faithful agent must ever have at heart the interest of his employer, he cannot be expected to look after that of the contractor. Most architects also desire to have the work done as well as possible, and the natural tendency is to impose on the contractor rather than to favor him, which makes it all the more necessary for the contractor to stand up for his rights.

(*Continued.*)

A CORRECTION.

EDITORS OF THE BRICKBUILDER.

Dear Sirs: — By some slip of the pen, I spoke of a working day of twelve hours, in my article on "Estimating Brickwork," September number, thirtieth line, second column. It should have been eight hours.

Yours truly,

F. E. KIDDER.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK. — In April we predicted that by this time business would be in a healthy condition, provided that the war was settled, and in most lines of business this prediction has been fulfilled; but in regard to building operations it is now too late to begin any edifice of large size so that it will be well under way before winter. Consequently there is very little new work of any consequence to report, although we have heard of several important buildings now being planned, but not to be built until spring. A number of architects have been busy with small cottages, some of them brick, but the majority built in the regulation way, viz.: brick foundations to line of water table, first story clapboards, and shingles above.

The English half-timbered style is rapidly growing in popularity, and the prettiest examples of it that we have in and around New York are built with the first story and terraces of dark red brick, with the half-timbered work above. This makes a pleasing contrast of color, besides adding much to the stability of the structure.

The following items of new work have been reported: —

C. P. H. Gilbert, architect, is preparing plans for a five-story,



TERRA-COTTA PANEL, SCHOOL NO. 7, BAYONNE, N. J.
Executed by the New Jersey Terra-Cotta Company.
Hugh Roberts, Architect.

fire-proof brick and stone residence to be built on 79th Street, between Fifth and Madison Avenues, at a cost of $125,000.

James E. Ware & Sons, architects, have prepared plans for a six-story brick, stone, and terra-cotta apartment house, Central Park, West, near 94th Street; cost, $100,000.

Schneider & Herter, architects, have planned two five-story brick and terra-cotta stores and flats to be built on 100th Street, corner Second Avenue; cost, $40,000.

Clarence F. True, architect, has prepared plans for six five-story brick and stone dwellings to be built on Riverside Drive near 83d Street; cost, $150,000.



IMPOST CAP, MAIN ENTRANCE, CAXTON BUILDING, CLEVELAND, OHIO.
Executed by the Northwestern Terra-Cotta Company.
F. S. Barnum & Co., Architects.

C. P. H. Gilbert, architect, is at work upon plans for a seven-story brick and stone fire-proof office and studio building to be erected on Fifth Avenue; cost, $185,000.

Chas. E. Reid, architect, has prepared plans for a six-story store and tenement building to be erected on Oliver Street; cost, $50,000.

Farnsworth & Miller, architects, have planned a three-and-one-half story brick dormitory for the New York Catholic Protectory; cost, $40,000.

N. C. Mellen, architect, has planned a three-story brick store and studio building to be built for the Cameron Company, on Fourth Avenue, corner 19th Street; cost, $160,000.

Buchman & Diesler, architects, are preparing plans for a six-story brick store building to be erected on Houston Street, at a cost of $50,000.

Three warehouses, built of brick and iron, and costing about $150,000 total, are soon to be erected in the Government Navy Yard, Brooklyn.

Edward Wenz, architect, has planned five four-story brick and stone flats to be built on Franklin Avenue, corner 168th Street; cost, $105,000.

CHICAGO. — The building trades have been much interested in the recent controversy between Mr. Downey, of the Board of Education, a contractor of long experience, and Mr. N. S. Patton, architect of the same board, and a man of no less experience in his own line. Mr. Downey introduced a motion compelling the use of a certain make of bricks to the exclusion of all others, and this motion was vigorously opposed by Mr. Patton, both for architectural reasons and also because it seemed to grant a monopoly to one favored firm. The brick manufacturers have entered protest against the Downey resolution; but the school board have gone so far as to order Mr. Patton tried for "insubordination." Mr. Patton is President of the Illinois Institute of Architects and stands high in Chicago. Mr. Downey was formerly Commissioner of Public Works. Hence the controversy, and the "trial" is given prominence by the daily press.

Questions affecting schoolhouse construction are of deep interest in Chicago just now, when the constant increase of school population is calling for so many new and enlarged school buildings. One of the newest for which plans have been drawn is the Dewey School to be erected at 54th Street and Union Avenue. Its exterior is of pressed brick and cut stone, and its interior fittings are most full and complete, the whole cost being $90,000.

New buildings are being erected on the site of the disastrous fires of last March, and it is to be noted that special precautions are being taken as to fire protection and sufficient elevator service. The Ayers Building on Wabash Avenue will have a front of white glazed terra-cotta and will be nine stories high. The Schoemmann Building, on which but little work has yet been done, is to be specially constructed for the carrying of heavy printing presses, and will have a front of stone and pressed brick.

Jenney & Mundie are the architects for a new twelve-story office building to be erected on the site of the National Life Building on La Salle Street. This is between the Association Building on the north of Arcade Court and the New York Life Building on the south of an intervening alley, and the fact that the interior walls of the latter building are of enameled brick and the former light-colored brick will afford much additional light to the interior of the new building.

The Western Methodist Book Concern will build a ten-story building on its lot at 57 Washington Street, from plans drawn by



HEADS FOR A BUILDING, MARKET SQUARE, WASHINGTON, D. C.
Executed in gray terra-cotta by the Excelsior Terra-Cotta Company.
T. F. Schneider, Architect.

Architect H. B. Wheelock. Mr. Wheelock also has planned a new structure for the wholesale region of Chicago, a warehouse on Market Street, which is to have a front of pressed brick and terra-cotta. Also at Canal and Jackson Streets an eight-story fire-proof building is being constructed, its exterior being of red pressed brick with stone trimmings.

A new Union Station is being built at Englewood, one particularly adapted to the elevated roadways of the four railroads, and also the electric service in the subway.

The Midlothian Country Club, Frost & Granger, architects, has just been completed. It is colonial in style with very ample accommodation in every line.

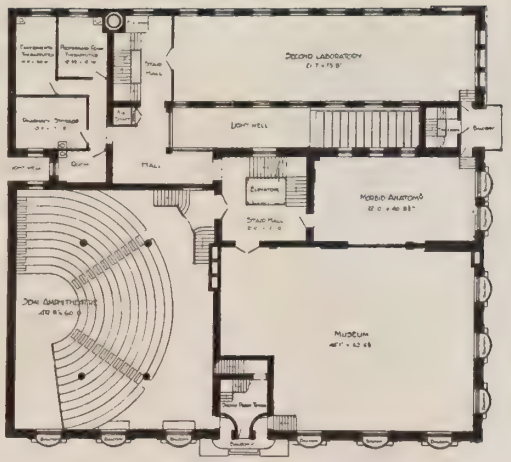
The Rock Island Road has also erected a new depot at the station about a mile from the club house, conforming in style of architecture to that of the club house.



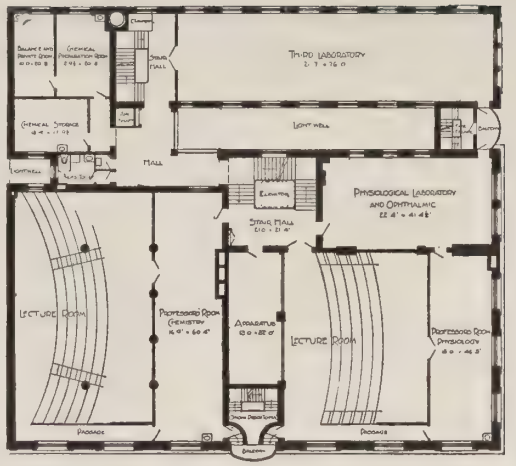
PANEL OVER THIRD STORY, BAYARD BUILDING, NEW YORK CITY.
Executed by the Perth Amboy Terra-Cotta Company.
Louis H. Sullivan, Lyndon P. Smith, Architects.

ST. LOUIS. — There is considerable complaint of dulness among architects and builders, although there is, beyond question, indications of improvement, which are quite likely to continue, and doubtless the beginning of the year will see the opening up of a good business.

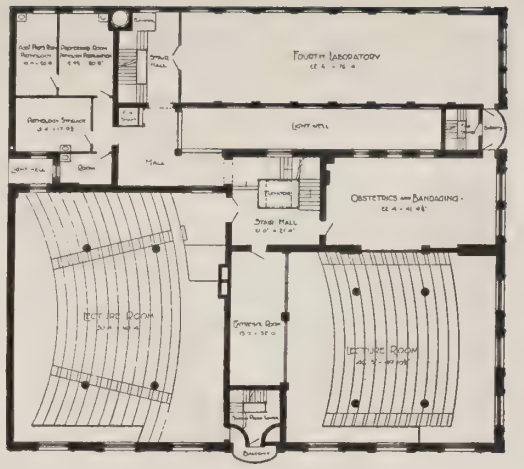
Real estate has become more active, and capitalists are offering money for investment at lower rates of interest. This, together with the general expanding and shifting of commercial interests, gives considerable encouragement.



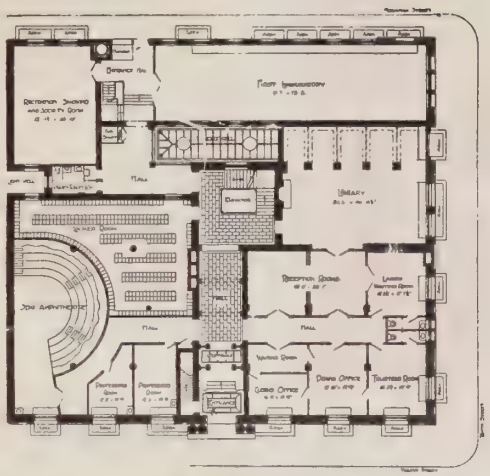
SECOND FLOOR.



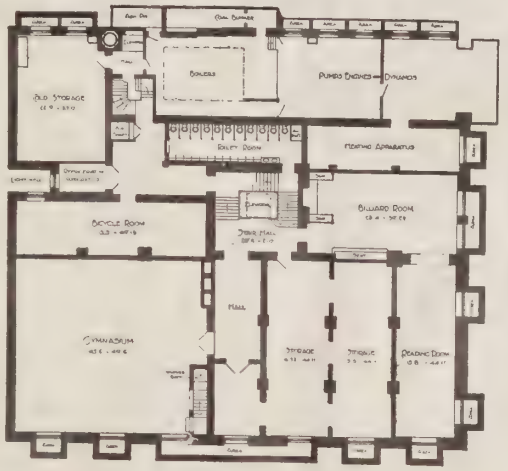
THIRD FLOOR.



FOURTH FLOOR.



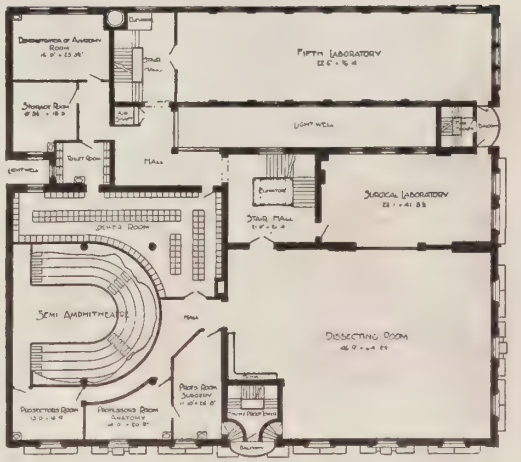
FIRST FLOOR.



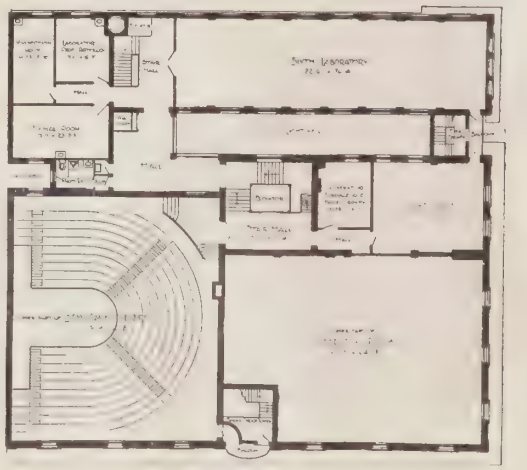
BASEMENT.



JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, PA.
James H. Windrim, Architect.



FIFTH FLOOR.



SIXTH FLOOR.



TERRA-COTTA DETAIL, ST. CHRISTOPHER'S CHURCH, NEW YORK CITY.
Executed by the Conkling, Armstrong Terra-Cotta Company.
Barney & Chapman, Architects.

The report of the Commissioner of Public Buildings for September shows a marked improvement in the class of work being done, as well as an increase in value over that for the same month last year of about 30 per cent.

The northeast corner of 6th and Olive Streets, around which memories cling of many visionary schemes in the past, ranging from six-story commercial buildings to twenty-two-story office buildings, is again attracting attention. This time it is proposed to erect a ten-story building at a cost of $200,000, and a permit has been issued to the Reliance Building Company for such a building. Architect Theodore C. Link has prepared the plans.

Another corner which has been the subject of several speculative schemes, and for which a permit was once issued for a twenty-two-story building, is the southwest corner of Olive and 7th Streets. It seems as though this may also be improved at once, and, although it may not be so pretentious as some of its near neighbors, nor approach the clouds so nearly as some of the previous schemes contemplated, it may become more famous from an architectural point of view. The building faces two alleys as well as two streets, and consequently will have light on every side. It will be only three stories high and of stone. Mr. Isaac Taylor, the architect, will make the most of the opportunity, and place there an architectural monument worthy of so prominent a corner. The building is for the St. Louis *Daily Republic*. It is gratifying to find occasionally an owner who is willing to sacrifice something to the finer feelings.

James Bright has the contract for a six-story warehouse near Cupples station, for the Simmons Hardware Company. The building is 63 by 120 ft. on 9th Street between Clark and Walnut Avenues. The plans were prepared by Shepley, Rutan & Coolidge.

T. B. Annan is the architect for a seven-story building facing on 4th Street 52 ft., for T. J. Lackland.

Adjoining this property occurred a very disastrous fire a few days ago, resulting in two deaths and a score or more of serious injuries. The building was occupied with sporting goods, and the fire and explosives completely wrecked it. It is rumored that it will be rebuilt at once.

The Commissioner of School Buildings, Mr. Wm. B. Ittner, recently awarded the contract for four more schools. The department is a year behind with its work and is striving to catch up.

CURRENT ITEMS OF INTEREST.

THE DAGUS CLAY MANUFACTURING COMPANY is furnishing 100,000 buff brick for a new power house at Williamsport, Pa.

THE GRUEBY FAIENCE COMPANY are lining a subway across Avon Street, Boston, for Jordan, Marsh & Co. It is to be done in a dull green and white.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY will furnish the terra-cotta for the new library at Hyde Park, Mass., and also for a new schoolhouse at Brookline, Mass.

THE SAYRE AND FISHER COMPANY, of Sayreville, N. J., have been very busy during the past season, and are placing orders for additional machinery with Chambers Brothers Company, of Philadelphia.

THE town of Somerville, Somerset County, N. J., has given the Berlin Iron Bridge Company, East Berlin, Conn., the contract for their new iron bridge. Span is about 60 ft., and the bridge has a clear roadway of 14 ft.

CHARLES BACON, Boston representative of the Excelsior Terra-Cotta Company, is supplying the architectural terra-cotta for the Whitman and Nonantum Blocks, Newton, Mass.; Fuller, Delano & Frost, architects; H. F. Ross & Co., contractors.

THE BERLIN IRON BRIDGE COMPANY, East Berlin, Conn., are



BURT'S THEATER, TOLEDO, OHIO.
The building is executed in three colors of brick and terra-cotta; the lower story in a gray brick, with a gray terra-cotta string-course separating it from the superstructure. The darker part of the superstructure, as shown in the photograph, is in a golden-yellow vitrified brick, and the lighter part of the diaper in a light cream buff, with the terra-cotta matching it.
Brick furnished by the Columbus Brick and Terra-Cotta Company; terra-cotta by the Winkle Terra-Cotta Company.
George S. Mills, Architect.



RESIDENCE AT BUFFALO, N. Y.
George Cary, Architect.

furnishing for the Laflin & Rand Powder Company, Pompton, N. J., the steel roof for one of their storehouses. The building is 45 ft. wide and 150 ft. long.

THE KITTANNING BRICK AND FIRE-CLAY COMPANY is furnishing buff bricks, shade No. 2, for the new Mead Building at Buffalo; L. P. T. Eckel, architect; and their Akron, impervious, dark pink Roman brick for the new Robinson Building, same city and architect.

THE BERLIN IRON BRIDGE COMPANY, East Berlin, Conn., have the contract for furnishing the steel work for the Memorial Hall being erected at Westerly, R. I. This building is to be fire-proof throughout, has steel floor beams and columns supporting the floor structure, and steel trusses and beams for the roof.

THE C. P. MERWIN BRICK COMPANY, Berlin, Conn., is furnishing the hollow brick for the Back Bay Station of N. Y., N. H. & H. Ry., at Boston; Shepley, Rutan & Coolidge, architects; Horton & Hemminway, builders. The company is making a specialty of side-cut headers in hollow brick, and is meeting with a large demand for same.

THE INDIANAPOLIS TERRA-COTTA COMPANY will supply the architectural terra-cotta which will be used in the new Law Building at Indianapolis; Louis H. Gibson, architect. The building is to be eleven stories high, and will have a frontage of 62 ft., which will be constructed entirely of terra-cotta.

THE C. P. MERWIN BRICK COMPANY, Berlin, Conn., is just completing its final shipments of ornamental red mud brick to the Pearl Street Church, Hartford, Conn.; C. A. Bartlett and Ernest Flagg, New York, associate architects. A great variety of shapes were required in this work, and the Merwin Company feel justly gratified at their success in filling the contract in such a creditable manner.

THE C. P. MERWIN BRICK COMPANY have added to their line of manufacture, hollow brick with closed ends. These are used for headers in connection with their other hollow brick. The following buildings are being furnished with hollow brick through their agent: the Connecticut Builders'



PARK THEATER, NIAGARA FALLS, N. Y.
(From *The Illustrated Buffalo Express*, Copyright, 1898, by Geo. E. Matthews & Co.)
The front brick are a dark flashed Roman, furnished by the Dagus Clay Manufacturing Company, Daguscahonda, Pa.
Orchard & Joralemon, Architects.

Supply Company, Pepion Block, Hartford, Isaac A. Allen, Hartford, architect, Washburn Brothers, contractors; Arsenal School, Curtis & Johnson, Hartford, architects, Chas. B. Andrus, contractor.

THE CELADON TERRA-COTTA COMPANY, LTD., is supplying the following new buildings with their roofing tiles: J. B. Hanna residence, Columbus, Ohio, Yost & Packard, architects; Winnetka School, Winnetka, Ill., W. A. Otis, architect, Chicago; Superintendent's residence, Ohio State Hospital for Insane, Massillon, Ohio, Yost & Packard, architects, Columbus, Ohio; Boys' Industrial School. Lancaster, Ohio, Richards & McCarthy, architects, Columbus, Ohio; A. Houghton, Jr., residence, Corning, N. Y., Pierce & Bickford, architects, Elmira, N. Y.; C. L. Poston, residence, Athens, Ohio, Yost & Packard, architects, Columbus, Ohio; Audubon Avenue School, New York City, C. B. J. Snyder, school architect, New York; Geo. T. Dickover, residence, Wilkesbarre, Pa., J. H. W. Hawkins, architect; C. B. Scoville, apartment building, Oak Park, Ill., Patton, Fisher & Miller, architects, Chicago.



RESIDENCE OF FREDERICK W. WEITZ, DES MOINES, IA.
Frederick W. Weitz, Architect.

THE ILLINOIS SUPPLY AND CONSTRUCTION COMPANY is incorporated in both the States of Missouri and Illinois. The officers are Wm. M. Louderman, president, and W. P. Grath, secretary and treasurer. The capital stock of same is $75,000, being fully paid.

The business of this company is the manufacture of face brick in the following colors: solid white, buff, silver gray, pink, steel gray, mottled, red and brown; also dealers in builders' supplies, perfection mortar colors, terra-cotta, fire-proofing, and vitrified street paving brick. The company is operating the plant of the American Hydraulic-Press Brick Company, located at Collinsville, Ill., eleven miles from St. Louis. The brick manufactured by them have a national reputation, being used in all the large cities of the States, and are manufactured by the latest improved hydraulic press, making brick of a uniform texture and free from granulation, every brick being subjected to a pressure of fifty tons. The plant is equipped with the latest improved Grath Patent Down-Draft Kilns, which patents are owned by the company. The company always keeps a large stock of plain and ornamental brick on hand in the various colors. In the later part of May the works were visited by a disastrous fire, the entire brickmaking department being destroyed. In place of frame buildings a large two-story brick building has been erected.

Views of the plant are shown in the company's advertisement, page xii.





Fireplace Mantels.



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Phila. & Boston Face Brick Co.,
15 LIBERTY SQ., BOSTON, MASS.



CHARLES T. HARRIS, President.
HENRY S. HARRIS, Vice-President.

WILL. R. CLARKE, Secretary and Treasurer.
ALVORD B. CLARKE, Superintendent.

The Celadon Terra-Cotta Co., Ltd.,

MANUFACTURERS OF

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ALFRED, N. Y.

(Under Babcock Patents.)





TOWNSEND MEMORIAL HALL, OHIO STATE UNIVERSITY, COLUMBUS, O., COVERED WITH CONOSERA ROOFING TILES.
PETERS, BURNS & PRETZINGER, Dayton, O., *Architects.*

OHIO STATE UNIVERSITY.

ALEXIS COPE, *Secretary.*

COLUMBUS, O., April 18, 1898.

Mr. CHARLES T. HARRIS, Alfred, N. Y.

Dear Sir:—We have just completed two College Buildings, Townsend Hall, length 260 ft., average breadth 70 ft., three stories, and the Biological Building, length 110 ft., average breadth 75 ft., two stories, and for roofing have used Conosera Tile.

So far we have only praise to speak of it. It adds much to the dignity and artistic beauty of the buildings, and we are glad we were able to use it.

We recommend it without reservation. After seeing it on the Law and Dairy Buildings at Cornell, we were not satisfied with anything else.

Very truly yours,

ALEXIS COPE, *Secretary.*

We have also covered the following named College Buildings, beside those named above, with Conosera Tile:—

ORRINGTON LUNT LIBRARY, Northwestern University, Evanston, Ill.
LIBRARY AT UNIVERSITY OF ILLINOIS, Urbana, Ill.
AGRICULTURAL BUILDING, Cornell University, Ithaca, N. Y.
SCIENCE HALL at Syracuse University, Syracuse, N. Y.

NEW YORK OFFICE,
SUITE 1123-4, PRESBYTERIAN BUILDING, 156 FIFTH AVENUE.

CHICAGO OFFICE,
SUITE 1001-2, MARQUETTE BUILDING, 204 DEARBORN STREET.



THE DELMONICO BUILDING, 44TH STREET AND FIFTH AVE., NEW YORK CITY.

JAMES BROWN LORD, ARCHITECT.

TERRA-COTTA AND BRICK BY THE

NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY,

PHILADELPHIA. 38 PARK ROW, NEW YORK CITY. BOSTON.

VOLVME VII NOV. 1898 No. 11

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

ROGERS & MANSON,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX 3282.

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A QUESTION OF ETHICS.

COURTS of law do not exactly teach architecture, but we listened to an interesting exposition upon the ethics of the profession a short time since in a court where we had the misfortune to be called as a witness in a suit brought by an architect to recover commission. A brother architect was on the stand, having been called by the plaintiff to testify in regard to certain points regarding professional charges. On the cross-examination the opposing counsel sought to bring out the suggestion that the plaintiff had first approached the defendant, whom he had tried to interest in himself to the extent of accepting plans, and the question was asked, "Is it not very common for architects to offer to submit plans on a venture, hoping that they may be accepted?" The question was promptly objected to by the plaintiff's counsel. The objection, however, was not sustained by the judge, who made the remark that the architectural profession was not at all like that of the doctor or the lawyer, members of which never solicited work, and that of course it was manifest and perfectly well known that all architects were glad to compete. We confess we have been interested in trying to reason out how the judge arrived at such an opinion, and can only conclude that he must have been somewhat unfortunate in his architectural acquaintances, for all of our observation and our knowledge of the profession here and elsewhere point to a directly opposite conclusion, and we believe that it is the rule rather than the exception for reputable architects to decline to speculate on their chances. The incident shows how little the architect's point of view is appreciated even by the educated portion of the community. As a matter of fact, among the architects who would be taken as types of the profession, their position in relation to their clients is precisely that of the lawyer, and if the time ever comes when the practise of architecture is surrounded with the same safeguards against ignorance that the law extends to the legal profession, it is quite likely that the architect's standpoint will be better understood. It may not be necessary for the public which pays for and occupies the houses which architects build to thoroughly appreciate the peculiar relations which necessarily exist between the honest, educated practitioner and his work, but, on the other hand, it is not fairly supposable that the architect should be ready at all times to scramble for his work and compete, cut prices, or do most anything to get a job. Recognition of a higher ideal will come with the growth of good architecture. One has only to look back a comparatively few years to see that the necessity for groveling is rapidly diminishing, and that though a learned judge may be disposed to class architects, hod carriers, and others indiscriminately, the profession has won for itself a place which commands a very decided measure of respect. The temptation to get work at any price is a constant one, and while the profession is so open to any one, irrespective of his ability, it is not strange that the position of the architect should be frequently misconstrued, and the good and the bad lumped together in a single category. It is the saving remnant who have high ideals, who constitute the real measure of what the profession stands for, and the leaven of that remnant is a force which is constantly increasing.

THE old New England best parlor, which was closed against sunlight, moths, and the family, only to be opened on state occasions for the benefit of strangers, might almost be termed a prototype of the spirit which is so manifest in our public buildings and which prompts some one, we cannot say whether architect or owner, to turn his best front towards the street and to content himself with the commonest kind of work on the inner courts or back alleys. This might have been permissible at one time when all our buildings were carried to a nearly uniform height, but since the advent of modern commercial methods, there is hardly a street which does not show some tall structure elbowing itself above its neighbors, offering a very brave array of finery towards the street, but ghastly in its nakedness elsewhere. This is surely an instance of inherent, if unconscious, bad taste. There is no good reason why a building should not be presentable on all sides. The argument that it is often built on party lines does not amount to a great deal, for it is the exception to find an adjoining owner who would not be willing, for a reasonable compensation, to allow the eaves to project over his property, and we venture the statement that, in most cases of public buildings, the neighbors would be quite ready to welcome such partial infringement for the sake of the added looks of the building. We need not expend elaboration on the unimportant sides of the building. There is no violation of good taste in recognizing that a building has a decided front, that one portion of it is to mark the entrance, or that the most desirable portions of the interior are to give on a façade which bears the greatest amount of elaboration; but to assume that we can spread our lavishness along the whole expanse of a front and then suddenly saw it off at the turning of a corner is to admit that our buildings are not designed as a whole, but that a frontispiece is put up simply for show. Without following this idea to the extent which Mr. Ruskin has seen fit to insist upon, we certainly can expect that when a property owner is to shoulder himself above his neighbors, he ought, for his own sake and

for the sake of the public that permits him to do such things, to see to it that the building, which is pretty sure to be visible in its entirety from several directions, shall present at least a dignified, respectable appearance on its less important sides. The extra cost of doing this is far less than is often spent by property owners in advertising the fact that such a building is in existence, and yet the beautifying of the plain walls, or, perhaps, to put it better, the rationalization of the plain walls, as a mere advertisement, would be worth all it would cost.

AND this suggests the oft-repeated query of our brick manufacturers, why the architects seem to prefer old, rough, misshapen brick to the product upon which the manufacturers have expended so much more thought and care. From an architectural standpoint the answer is natural enough. We have seen repeated instances of side walls of buildings which, as far as the material went, was more interesting than the press brickwork of the front. This was not, however, because common brick was used in one case and pressed in another, but was simply one of those accidental happenings which sometimes set at naught the wisdom of the academy, just as a tumbledown, dilapidated, old mill may be much more beautiful than a smart, new affair. We have yet to see an interesting effect produced by the use of a poor quality of brick that could not be duplicated and bettered with the use of a good brick, and the cause for rejoicing over picturesque old brick walls is not in the quality of the material so much as in the way it is used. If good brick be used with a mixture of picturesque appreciation, such as might find expression in some of the old things we admire, the result would be undoubtedly better than when we are obliged to content ourselves with the ruder product. Other times, other manners. The rough brick which might have pleased the medievalists cannot lend itself rightly to modern work. We can get the picturesque effects, but we must use better material, and, fortunately, the picturesque qualities are not a concomitant solely of crudeness of manufacture.

PERSONAL, CLUB, AND SUNDRY NEWS ITEMS.

FREDERICK N. REED, architect, has removed his office to 52 Kilby Street, Boston.

WM. H. GORNPERT, architect, 2761 Atlantic Avenue, Brooklyn, N. Y., would be glad to receive samples and catalogues.

THE Columbia College scholarship for this year goes to William C. Ayres, a draughtsman in the office of Ernest Flagg.

R. MAURICE TRIMBLE, architect, has opened an office in the Ferguson Building, Pittsburgh, Pa. Samples and catalogues desired.

THEODOR G. AHRENS, architect, has opened an office at No. 8 East Lexington Street, Baltimore, Md. Samples and catalogues desired.

ERNEST FLAGG has been appointed by the Government (Navy Department), architect for the new building to be erected at Annapolis. It is estimated that the total cost of these buildings will be fully $10,000,000.

AT the thirty-second annual convention of the American Institute of Architects, held at Washington, November 1, 2, and 3, the following officers were elected: President, Henry Van Brunt; first vice-president, W. L. B. Jenney; second vice-president, J. W. McLaughlin; secretary and treasurer, Glenn Brown; auditors, S. A. Treat and W. G. Preston; directors, for one year, F. M. Day, J. C. Hornblower, T. D. Evans; for two years, R. W. Gibson, L. T. Scofield, W. M. Poindexter; for three years, A. G. Everett, W. C. Smith, G. B. Post.

THE limited competition for the Shattuck Prize, offered by the Mechanics' Charitable Association of Boston, for the best design for workingmen's houses, has been decided by the award of the prize to R. Clipston Sturgis, of Boston. The open competition was decided in favor of George E. Barton and George G. Will, draughtsmen in Mr. Sturgis's office.

The amount of the limited competition prize was $750, and that of the open competition, $450.

The judges were Prof. F. W. Chandler, John M. Carrere, and H. Langford Warren.

THE drawings submitted in competition for the Cornell University Traveling Fellowship in Architecture were exhibited and judged at Washington during the recent meeting of the A. I. A.

The competition program called for a Grand Stairway for a Metropolitan Library, the winner to receive $2,000, paid in instalments, in the manner common to all University Fellowships. W. Herbert Dole, a draughtsman in the office of Ernest Flagg, New York City, was placed first, while Floyd Y. Parsons and Ira C. Sheldon were given honorable mention.

The judges were John M. Carrere and William A. Boring, of New York City, and Edward B. Green, of Buffalo.

A REGULAR meeting of the T Square Club, Philadelphia, was held on Wednesday evening, November 2, at which the subject for competition was "The Porte-Cochère of a Theater." First mention was awarded to Alfred M. Githens; second mention to Wetherill P. Trout, and third mention to Oscar M. Hohanson.

The Club gave a "smoker" on the evening of November 16, at which the drawings entered in competition for St. Paul's Church at Overbrook were exhibited. Professor Laird explained how the designs were viewed by the church committee in making the awards.

At a meeting held on the evening of November 2, the Club gave $100 as a nucleus of a fund to be used for the purpose of erecting in Philadelphia a permanent memorial to commemorate the successful termination of the late war with Spain.

ILLUSTRATED ADVERTISEMENTS.

THE medallion of Thomas Jefferson shown herewith is modeled from a painting by Gilbert Stuart. It will be used in connection with other work in the vestibule of the Jefferson Medical College, Philadelphia; designed by Mr. James Windrim. The work



is being executed by the New York Architectural Terra-Cotta Company.

In the advertisement of Fiske, Homes & Co., page x, is illustrated one of their mantels, erected in a billiard room. A residence at Buffalo, of which Green & Wicks were the architects, is shown in the advertisement of The Harbison & Walker Company, page xv. The United States Post-Office at Madison, Ind., is shown in the advertisment of the Ludowici Roofing Tile Company, page xxvi.

The American Schoolhouse. XIII.

BY EDMUND M. WHEELWRIGHT.

SPECIFICATIONS FOR A SCHOOL BUILDING.

(*Concluded.*)

SECT. 11. MORTAR. — (*a*) Mortar for laying brick and stone masonry shall be prepared from sand and cement of the qualities before specified. The ingredients are to be evenly spread and thoroughly mixed dry, in the proportion of one part by measure of cement to two parts of sand, and a moderate quantity of water is to be afterwards added to produce a paste of the proper consistency; the whole to be quickly and thoroughly worked.

(*b*) Cement mortar shall be mixed in such quantities as will allow it to be used very soon after being mixed, and any cement mortar not used within three quarters of an hour after being first wet shall be rejected.

SECT. 12. ASPHALT. — (*a*) Give one thick coat of hot asphalt to rough brickwork of exterior door and window jambs and outside of foundation walls and brickwork below top of ground.

(*b*) Waterproof bottom and sides of trenches and conduits with two moppings of hot asphalt on two thicknesses of heavy tarred paper.

(*c*) Cover in best manner with best Neuchâtel or Syssel asphalt the floors of rooms so noted on plans.

SECT. 13. EXTERIOR STONEWORK. — (*a*) Provide and set exterior trimmings as shown on ¼ in. and ¾ in. scale drawings; all to be of best quality [Blank] sandstone, [Blank] limestone, [Blank] marble, and to the satisfaction of the architect.

(*b*) All moldings must be cut sharp and true, exposed surfaces to be fine crandalled [hand tooled] in a manner satisfactory to the architect.

SECT. 14. STONE SETTING. — Set all cut stone in best manner in cement mortar, as above specified, and clamp well to brickwork with galvanized-iron clamps.

SECT. 15. NORTH RIVER STONE. — (*a*) Furnish and set 4 in. North River bluestone slabs planed on top for pipe trenches and conduits.

(*b*) Furnish and set outside steps of best quality North River bluestone, fine axed in best manner.

SECT. 16. FLOORS, AND ROOF FRAMING. — (*a*) Provide all materials for and construct all floors and roof of wholly incombustible materials. This construction may be either: —

(1) Steel frames, girders and beams, with flat terra-cotta arch construction, with beams protected by end-construction soffit tile; all thoroughly filled about steelwork with cement mortar and filled to top of grounds with concrete.

(2) The concrete and steel construction of the [Blank] Company for floors.

(3) The fire-proof and steel construction of the [Blank] Company.

(*b*) Whichever construction is used, it will be required to safely sustain the load required by the building laws of the city of [Blank], and the contractor shall present to the architect, before applying for permit, a complete set of framing plans, showing the method of construction proposed, and subject to the approval of the architect.

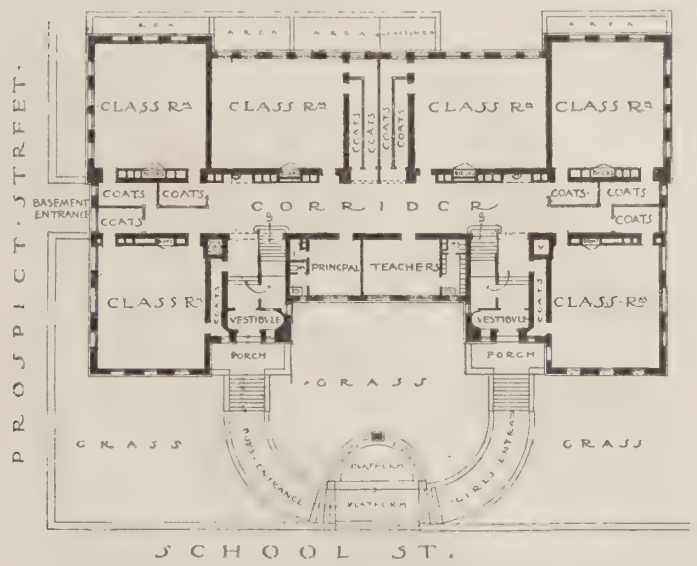
(*c*) The floors shall be finished level and true on under side, and be arranged for plastering of ceilings directly on floor construction, except where ceilings are furred down.

[(*d*) Supply and set the steel framing for walls, which shall be of ample strength to sustain the superstructure, and shall be subject to the approval of the architect. Sectional drawings of the construction shall be submitted to the architect for approval.]

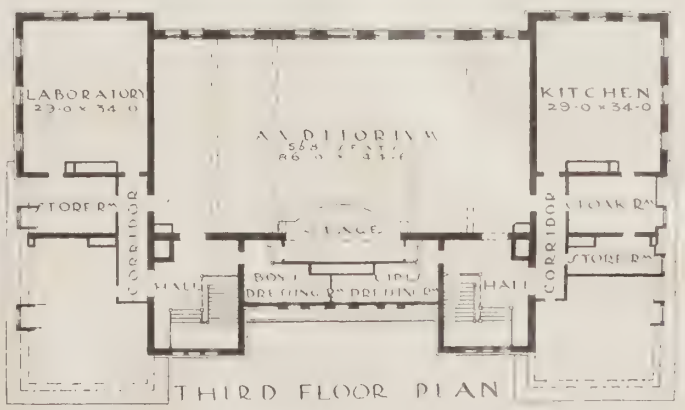
(*e*) Furnish and set all plates, connections, anchors, ties, T's, bolts, and washers requisite for the construction of said floors, steel framing for walls and roofs in the best and most workmanlike manner, and do all drilling and jobbing to fully complete the work. All



PIERCE GRAMMAR SCHOOL, BROOKLINE, MASS.
Julius A. Schweinfurth, Architect.



FIRST FLOOR.



PIERCE GRAMMAR SCHOOL, BROOKLINE, MASS.
Second story is a duplicate of first story, except that in place of teachers' rooms, there is a room to be used for teaching sewing.

iron and steel work is to have one heavy coat of good red lead and oil, when delivered, and one coat after being set in position.

SECT. 17. IRONWORK.—(*a*) In addition to the iron and steel work required under section 16, furnish all iron and steel shown on plans.

(*b*) All ironwork is to have one heavy coat of good red lead and oil when delivered, and one coat after being set in position.

(*c*) Furnish for all openings lintels of form and size shown on ¾ in. scale drawings. Furnish lintels required for vent and heat openings.

(*d*) Furnish all beams, ties, braces, lintels, railroad irons, masons' iron, etc., not specially called for, but required for the completion of the building.

(*e*) Furnish in accordance with design shown on ¾ scale drawing and in accordance with full-size drawing, the window and door grilles, to be set in best manner by the contractor.

(*f*) Furnish boiler flue of ¼ in. boiler iron, [Blank] in diameter, thoroughly riveted, and securely set same with wrought-iron supports.

SECT. 18. IRON STAIRCASE, ETC.—(*a*) The contractor shall take all measurements at the building, and erect the several flights of stairs in a neat and workmanlike manner, furnishing all bolts, nuts, screws, washers, etc. All beams and channels are to have, at bearings, plates 1 by 8 by 12 ins., and other sizes as marked on framing plans, and where members are framed they are to be coped and put together with angle plates, properly bolted; also do all drilling, boring, and jobbing to fully complete the work. All the flights are to have channel-iron stringers; the landings of channel-iron and T and angle-iron framing.

(*b*) All girders, beams, channels, angles, etc., are to be smooth, straight, and true, and all cast work is to be from soft gray iron, free from sand-holes or other blemishes, to be smoothly finished up, and all mouldings are to be clean and sharp.



SOUTH BOSTON HIGH SCHOOL, SOUTH BOSTON, MASS.
Herbert D. Hale, Architect.

(*c*) Stairs to be built strictly in accordance with the full-size drawings.

(*d*) [Rail to be of wrought-iron pipe set as shown on ¾ in. detail drawing.] Posts to be surmounted by large ball as shown.

(*e*) Treads and landings to be of cast iron, and to be completely covered with [Mason safety treads]. [⅛ in. rubber mat like sample in architect's office.]

(*f*) Paint the whole two good coats of good red lead and oil, one at foundry, and one when stock is delivered at site.

SECT. 19. ROOFING AND METAL WORK.—(*a*) Cover all roofs, except those shown to be of copper, with best 5-ply composition roofing, put on in the best manner on top of roof.

[Cover roofs with heaviest Neponset paper, and lay with the best even color, non-fading, Standard No. 1 Monson blue slate, or equivalent, subject to approval of the architect, and laid with 4-in. head cover, well bonded and nailed with four-penny tin nails. Bed slates in the best elastic oil cement for last two courses at ridge.] The copper roofs to be 16 oz.

(*b*) All flashing of chimneys, projecting stone-courses, ventilator curbs, valleys, battlements, walls, coping, etc., or other rising parts and covering of crickets, scuttle, ridges, and molded capping, to be of 16 oz. copper. Cover top of brick wall under coping stone with ⅛ in. sheet lead, as shown on ¾ in. scale drawings.

(*c*) Provide and set where shown, skylights of 16 oz. copper; the same to be constructed in the most workmanlike manner, and to be of construction approved by the architect, to be furnished with condensation gutters and ventilators, and to be glazed with best quality wire glass.

(*d*) Furnish and set ventilator of approved make, where shown, all as per detail, of 18 oz. copper on wrought-iron frame.

(*e*) Furnish and set cowls for vent ducts of 18 oz. copper on wrought-iron frames, all as per full-size detail.

(*f*) Make the whole roofing work perfectly tight, and keep it so for one year from date of acceptance of the building by the architect.

SECT. 20. CORNICES.—(*a*) Provide and set cornices of copper, all in accordance with detail drawings and directions. Furnish all structural iron and steel framework for the above work as may be later required by full-size details. Provide sleeves of 20 oz. copper where conductors pass through roof, strongly secured in place.

(*b*) Provide 16 oz. copper conductors where shown; the connection of same with sewer to be provided by the contractor for plumbing. Provide copper wire muzzles or strainers for each conductor outlet and fasten securely to the roof. Provide sleeves and cesspools in roof at conductor heads as indicated, all of 20 oz. copper, and connect with all conductors with lead goosenecks.

SECT. 21. METAL VENTS AND HEAT DUCTS AND REGISTERS.—Metal vents and heat ducts and registers will be provided and set by the contractor for heating and ventilation. (For ventilator on roof, see section 19.)

SECT. 22. CARPENTRY.—(*a*) The carpenter is to assist all other mechanics employed in building, including those employed upon plumbing, heating, ventilating, and electric work. He is to do all cutting, jobbing, furring, blocking, finishing, and setting of approved strips, etc., and provide all forms, centers, and lintels required by the architect.

(*b*) When required, provide cloth-covered screens, and fit properly to all window openings, including basement; also board up the entrances as directed, and provide suitable doors and hardware, locks, etc., and keep same in repair during the progress of the work.

(*c*) [Furnish all timbers, bolts, rods, hangers, joint bolts, anchor iron, dogs, etc., for floors and roofs as called for by drawings, as required by the building laws, and to make the work satisfactory to the architect. Frame, mortise, pin, raise, and fix in position the several floors and roofs, sizes to be as noted on drawings. Floor timbers to be anchored to walls and dogged together so as to form a continuous tie across the building everywhere.

(*d*) [Crown all floor timbers, ceiling joists, etc., ¾ in. where span exceeds 15 ft. and gage to an even width.

(*e*) [All the floor, ceiling, and roof timbers, girders, etc., are to be of the best quality straight-grained, seasoned Georgia pine, of full and square dimensions, and free from large or loose knots, shakes, wains, or sap.

(*f*) [The wall plates to be secured to brickwork by iron bolts every 6 ft., as shown on ¾ in. detail drawing.]

(*g*) [Cross-bridging where shown to be 2 by 3 in. stock thoroughly nailed together.]

SECT. 23. UNDER FLOORS.—(*a*) Lay on all fire-proof floors spruce boards ⅞ in. thick [or better, Georgia pine plank 2 ins. thick, dogged on to steel construction with wrought-iron dogs], thoroughly seasoned, mill-planed, well strained to joints, headings run by, double spiked on every bearing; floor boards to be free from large or loose knots, shakes, or sap, left perfect in every particular after other mechanics and ready to receive upper floor.

(*b*) Lay between upper and under floors heaviest Neponset building paper, breaking joint. [Lay between upper and under floors fire-proofing to be approved by architect.]

SECT. 24. ROOF PLANKING. — (*a*) Cover the roofs with 2 in. planed and matched, thoroughly seasoned Georgia pine plank, free from loose knots or shakes, well set up [and strongly spiked to rafters], and dogged with wrought-iron dogs on to steel construction.

(*b*) Fur for metal cornice, and prepare the roof for roofing, to the satisfaction of the architect.

SECT. 25. STUDDING AND FURRING. — (*a*) Partitions, where not shown as brick, are to be of steel channels, furnished and set by plasterer.

(*b*) Furnish and set 3 by 3 in. pine studding around all door or sash openings in channel-iron partitions.

(*c*) Furnish approved beveled screeds of chestnut, to be bedded into concrete floors, and also in pitch roofs.

(*d*) Furnish wood bricks for mason to build into walls to give nailings for furring, etc.

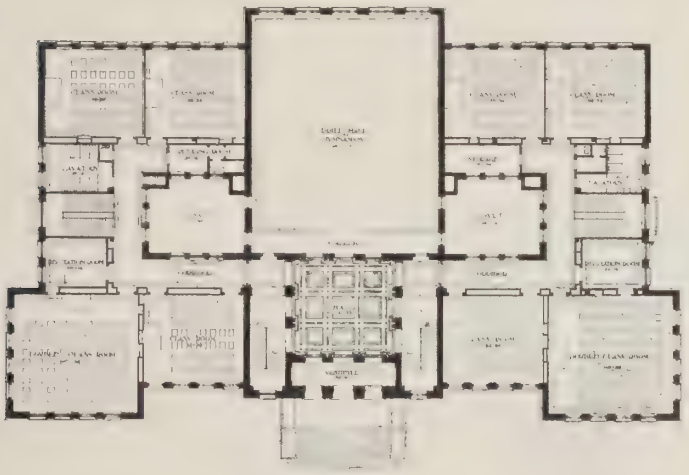
(*e*) Put on all grounds, angle, or corner beads for receiving the plastering throughout the building. Grounds to take plastering properly as directed.

SECT. 26. WINDOW FRAMES AND SASH. — (*a*) Make frames for windows, as shown by elevations and detail sheet, as per details, of pine. Inside to be veneered to compare with the finish of the several rooms. Pulley stiles, parting, and stop beads of hard pine. Stiles are to be fitted with bronze-face 2 in. steel axle pulleys. Sills of 2½ in. pine plank are to be thoroughly seasoned and free from knots, sap, or shakes.

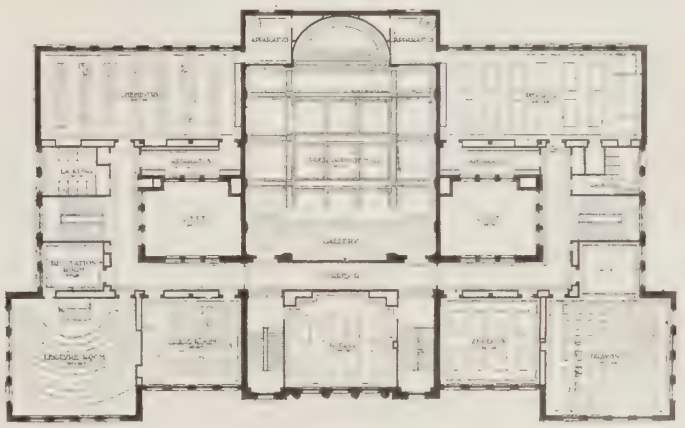
(*b*) All exterior or interior single sash windows or transoms are to have rebated pine plank frames of well-seasoned, clear stock, the exterior frames 2½ ins. thick; interior frames 2 in. stock. All to be put together in the best manner. Window frames are to be painted one coat by contractor before being set (see section 34), and are not to be set until just before plastering is begun.

(*c*) Construct double run sash 1¾ ins. thick, with muntins 1⅛ ins. wide, arranged for the number of lights indicated on drawings, of best quality, thoroughly kiln-dried pine stock, molded, tenoned, glued, put together, and pinned in best manner, hung with best linen sash cord and round cast-iron weights to accurately balance sash when glazed; sash to be stained one coat. Exterior single sash and transoms to be the same as above. Interior transom and other sash to be of ash.

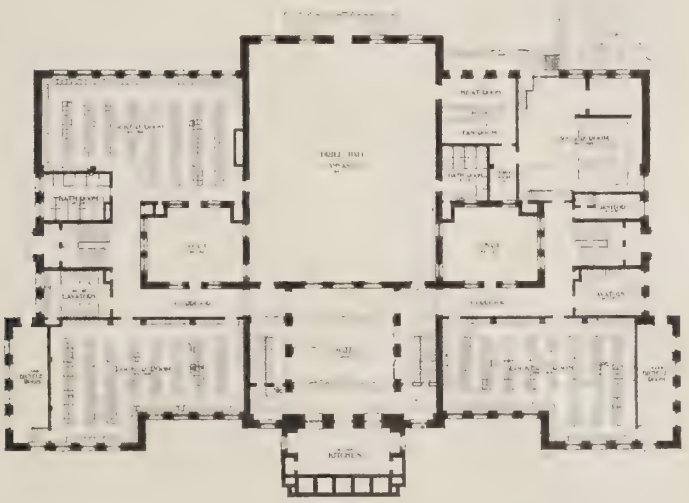
SECT. 27. DOOR FRAMES AND DOORS. — (*a*) All entrance door frames to be of first quality white pine plank, and securely fastened to masonry with iron dogs. All interior door frames to be of well-seasoned pine plank; all except those for closet doors to have transoms over them, which are to be veneered, where required, to conform with the finish of the several rooms; all as per detail drawings.



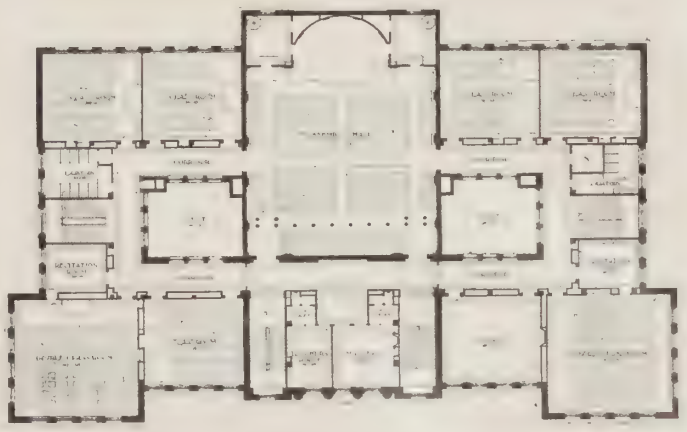
FIRST FLOOR.



THIRD FLOOR.



BASEMENT.



SECOND FLOOR.

SOUTH BOSTON HIGH SCHOOL, SOUTH BOSTON, MASS.

(*b*) All interior doors to be custom made, of thoroughly kiln-dried, first quality pine stock, veneered with properly selected brown ash, or oak, corresponding with the finish of the several rooms, flush-molded, mortised, tenoned, wedged, glued, and put together in the best manner; all as per scale and detail drawings, and all to have transoms, except closet and water-closet doors.

(*c*) Outside doors 2¼ ins. thick of white pine; interior doors 1¾ ins. thick, except those for water-closets, which will be 1¼ ins. thick.

(*d*) Inside doors are to have ⅞ in. thick best quality, rift

Pensacola hard pine thresholds, beveled on both edges, where not otherwise provided.

(*e*) All doors, except for toilet rooms and closets, to have one panel glazed with first quality double thick German glass.

SECT. 28. INSIDE FINISH.—(*a*) The inside finish, except as otherwise specified, is to be of first quality kiln-dried brown ash, of even color, all sandpapered off with the grain, and according to detail drawings.

(*b*) Provide a base around all rooms, corridors, closets, etc., of molded brown ash, as per ¾ in. detail drawing and full-size drawing, to be seen in estimating room, and also molded plinth blocks for all doors, using turned corners at all angles and jambs.

(*c*) Trim around all registers with molded ash.

(*d*) The office and library to be finished in first quality quartered oak, with cornice, boxed beams, and paneled ceilings, and with door and window trims of oak.

(*e*) Provide and set chair rail throughout all rooms with plastered walls.

(*f*) Provide and set 1¾ in. picture molding to run between the windows, of wood, to correspond with other finish, and in all school and recitation rooms.

SECT. 29. UPPER FLOORS.—(*a*) Upper floor boards throughout, except as otherwise specified, to be of the best quality rift Pensacola hard pine, not over 4 ins. wide, matched and blind nailed, planed to an even thickness, ⅞ in., all thoroughly kiln-dried, well strained, all heading joints run by and cut plumb and square (over a bearing in every case).

(*b*) Upper flooring in library and office to be quartered oak; to be ⅞ in. thick, not over 3 ins. wide, matched, and blind nailed.

(*c*) All the upper floors are to be planed and traversed and scraped to a uniform surface without ridges, etc., for first-class work. This work is to be done the last thing after painter has completed his work on the standing finish.



GIBSON DISTRICT GRAMMAR SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.

SECT. 30. MISCELLANEOUS CARPENTRY.—(*a*) Provide movable teachers' platforms and fit up the toilet rooms, water-closets, bowls, etc., as shown on plans as directed.

(*b*) Put up two shelves of seasoned pine in all closets, over hooks, as the architect shall direct.

(*c*) Supply and set shelving, drawers, etc., in chemical storage room, dark room, and apparatus room; the glazed partition to run from baseboard to ceiling and to have simple cornice.

(For glazing, see section 34.)

The shelving in these rooms is to run to ceiling.

(*d*) Supply and set frames and 2¾ in. chalk receivers for all blackboards.

(*e*) The contractor is to allow and pay the sum of [Blank] dollars for electric clock dials.

(*f*) The contractor is to allow and pay the sum of [Blank] dollars for bookcases and wainscoting in library and office.

(*g*) Allow and pay the sum of [Blank] dollars for tables and furnishings of physical and chemical laboratories in addition to those otherwise specified.

(*h*) [Supply and set 2¼ in. ash hand rail for all staircases.]

(*i*) Supply and set 2¼ in. ash wall rail on bronze brackets (see section 31) for all runs of staircases, except on landings.

SECT. 31. HARDWARE.—(*a*) Furnish and supply all hardware trimmings and fixtures throughout the building, to be of solid bronze metal unless otherwise specified.

(*b*) Outside entrance doors are to have vestibule locks. Provide suitable door checks, of a make to be approved by said architect. Provide door catches, of a pattern to be approved by said architect, for outside doors and 5½ by 5½ in. bronze metal butts, bronze metal knobs, and large escutcheon plates.

(*c*) Doors of physical and chemical laboratories and of office — are to have [Blank] lock, master-keyed.

(*d*) All other doors are to have [Blank] three-tumbler lock, and with the same master-key, with 5½ by 5½ in. bronze metal butts.

(*e*) Knobs to be of size and shape to be approved by architect, and are to have key-plate escutcheon.

(*f*) Sash-fasts, lifts, and flush-pulls are to be of approved make and of finish to match door trims.

(*g*) Provide Climax stop adjuster for all inside beads of sash.

(*h*) Transom sash are to be hinged and to have "Solid Grip" transom rods of bronzed iron.

(*i*) Provide two rows of bronze hooks for all closets.

(*j*) Provide brass rubber-tipped door stops for all doors in building.

(*k*) Provide bronze rail brackets for wall rails of staircases.

(*l*) Provide all other hardware not specially mentioned, bolts, latches, scuttle fixtures, etc., as required or directed to complete the job.

SECT. 32. GAS-PIPING.—Pipe for gas outlets as shown on plans in the best manner; all to be done in accordance with the regulations of the gas company, connecting with street supply, making meter connections, paying all charges, making whole complete; all outlets to be capped.

SECT. 33. LATHING AND PLASTERING.—(*a*) The ceilings throughout addition are to be plastered directly on floor construction, and plastered ceilings where furred down [or where wooden floor construction is used] are to be lathed with No. 19 stiffened wire or "B" expanded metal lathing, securely fastened to metal furring strips [where wooden floor construction is used, the same is to be furred for ceilings with beveled Georgia pine strips], in best manner.

(*b*) Wire-lath across all iron beams, lintels, vent ducts, or other openings in brick walls that are plastered directly on the brick, as required to make a thorough first-class job.

(*c*) Wire-lath as above across all channel-irons in minor partitions.

(*d*) All furring is to be of iron. [This is only applicable to fireproof construction.]

(*e*) Minor partitions are to be constructed of studs of ¾ by ⅜ in. channel-iron, set 16 ins. on centers, fastened securely with staples or nails at top and bottom, and set true and straight.

(*f*) Attach "B" expanded metal or No. 20 galvanized Clinton wire-lath to front side of studs with No. 18 annealed wire; allow ¼ in. for grounds over face of lath on front of partition, and ¼ in. over studs on back of partition, unless otherwise directed by the architect.

(*g*) The channel-iron studs are to be securely fastened at top and bottom to cross pieces of 1 in. channel-iron. Channels at all openings to run to floor.

(*h*) Grounds for doors and windows are to be set in position by carpenter before iron studs are set.

(*i*) These partitions are to be rodded true and straight, and be plastered with King's Windsor cement, or Adamant, or Higginson's Prepared Mortar, flush with grounds on both sides of partitions, and when finished to be 2 ins. thick; the iron framework to be braced with temporary wood bracing from the back of the partition to the floor; this bracing to be set by plastering contractor, furnishing iron and lath, and is to be removed by plastering contractor after the face of partition has been plastered, and plaster has set sufficiently hard to hold partition straight and true.

(*j*) Wire on and securely fasten all necessary grounds and clamps for plumber's pipes, and for gas pipes and electric wire tubes, and for light fixtures.

(*k*) Furnish and set 1½ by 2 in. T iron frames for all doors in minor partitions.

(*l*) All plastering to be the best three-coat work.

(*m*) Plaster all walls throughout and ceilings, including basement ceiling, with same cement or mortar that is used on channel-iron partitions, lathed surfaces throughout, and all brick walls, where not otherwise specified or noted on plans. All to have grounds of proper thickness as directed by the architect.

(*n*) Brick walls to be plastered directly on the brick. Mortar to be well keyed and hand floated.

(*o*) Skim-coat plaster work, all to a true and even surface; angles and arrises to be quarter-circle throughout both walls and ceilings, except in library and office.

(*p*) Plasterer to provide and set all fire-stops required by the building laws, protect all weight-bearing metal with plaster and wire lath as directed.

(*q*) Run beads of English Keene's cement on Portland cement backing, for all doors and window trims and jambs in plastered rooms, except in library and office.

(*r*) Allow and pay the sum of [Blank] dollars for blackboard surface, this price to include the setting of same.

(*s*) Do any required patching at completion of the building and leave the entire plastering work clean and whole.

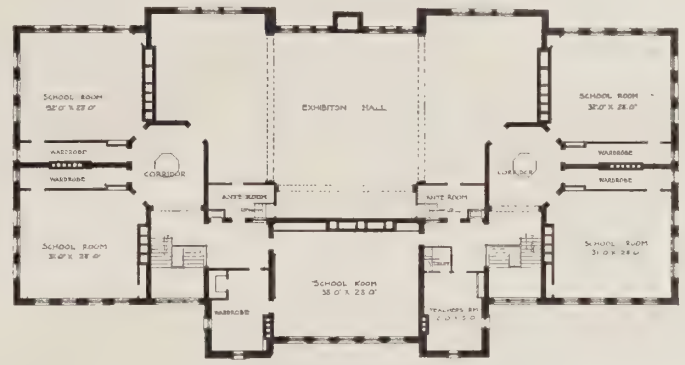
(*t*) Clear away all plasterer's rubbish.

SECT. 34. PAINTING AND GLAZING.—(*a*) Thoroughly putty-stop and sandpaper all woodwork.

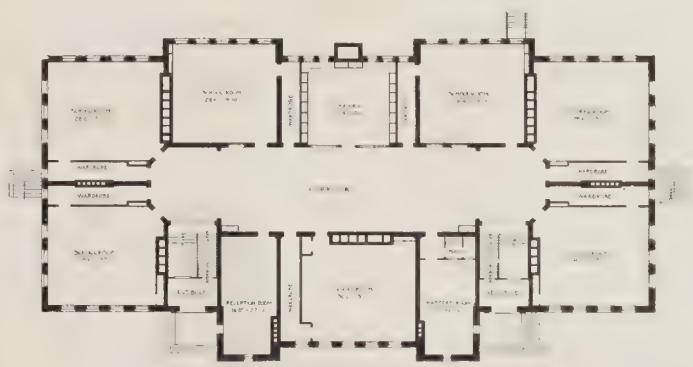
(*b*) Paint all exterior woodwork four coats of best lead and oil, the priming coat to be put on immediately after the work is in place.

(*c*) Paint with three coats of lead and oil, heating and vent flues opposite all register openings.

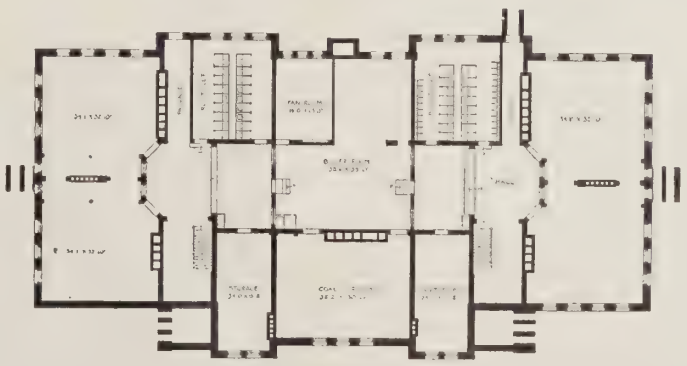
(*d*) Paint ironwork and all metal work four coats of [Blank] metal paint, in addition to the paint previously specified for the same; colors and finish to be selected by the architect.



SECOND FLOOR.



FIRST FLOOR.



BASEMENT.

GIBSON DISTRICT GRAMMAR SCHOOL, BOSTON, MASS.

(*e*) Paint with four coats of best lead and oil, in colors to be selected, all exposed brickwork of basement.

(*f*) All oil used to be linseed oil from best Calcutta seed; lead to be ["Blank"] or ["Blank] Lead Works" best lead. Samples of the above are to be submitted for testing, and all paints are to be mixed at the building.

(*g*) Paint window frames and sills all over, except hard pine, before they are delivered at the building.

(*h*) Give parting and stop beads of windows one coat of oil and two coats of hard-oil finish. Grease pulley stiles with "beef's cod."

(*i*) All other finish, except where otherwise specified, is to be well filled and rubbed and is to have four coats of shellac, rubbed with pumice and oil to dead finish. All work about water-closets to have two coats of hard-oil finish with high gloss.

(*j*) Mahogany stain inside of all exterior sash, and finish with one coat of shellac and two coats of hard-oil finish.

(*k*) Finish all oak floors with coat of shellac and two coats of Butcher's Boston Polish in the best manner. Hard pine floors are not to have painter's finish.

(*l*) Paint all plastering to height of 7 ft. 6 ins. above the floor and all Keene's cement work four coats of lead and oil. Tint the walls above this height and all ceilings above basement with water color.

(*m*) All colors to be given by the architect.

(*n*) Glaze throughout with first quality, double thick German or Berkshire glass, well bedded, tinned, and puttied. The sashes must not be put in before the putty has hardened thoroughly. The basement windows, ceiling lights, toilet-room doors, and wherever marked are to be glazed with fine ribbed glass.

(*o*) Glaze with German glass as above the interior doors.

(*p*) The entire work is to be left whole, clean, and complete.

THE effect of frost, which tends to disintegrate bricks and stone, can be determined by a very simple test; namely, by direct freezing, says the *British Brickbuilder*. Let typical samples of the goods be chosen during frosty weather, and saturated with water, and then alternately frozen and thawed a dozen times or more. Now, if the samples to be tested are weighed dry, and the loss of weight by exfoliation determined also on the dry samples, the thing is accomplished. It would be possible to create a standard of permanency by counting a given percentage of loss as unity (this would have to be chosen arbitrarily) and then referring other percentages of loss to it. Thus might be created a scale of permanency, and when about to enter into a contract this might be referred to just in the same way as the resistance to crushing strain is now quoted.

Terra-Cotta Balustrading.

BY THOMAS CUSACK.

IN further elucidation of this subject, we give at Fig. 67 one section of parapet balustrading, which, whether by accident or good intention, proved well within the capabilities of the material in which it was made. This is due to the harmonious relationship of the members, also to the nice ratio of voids and solids obtained in fixing the size of these members. In this way a uniform shrinkage was secured, equalizing the strain during that critical process. The piece before us is 2 ft. 6 ins. by 3 ft., and but 4 ins. in thickness. There was no difficulty experienced in the execution of a score such pieces, and the size might have been increased considerably (had that been necessary) without incurring serious risk. With a thickness of 6 ins., single pieces such as this would be quite practicable up to, say, 3 by 4 ft.; even at that size, we doubt whether the limit would be reached.

At Fig. 68 we have a piece of balcony balustrade of the same general character. It is set up temporarily in connection with the dies and capping the better to illustrate both design and construction. In trueness of line, as in other points of mechanical excellence, this work will bear comparison with the best cut stone. As for price, where two or more such balconies are required, it ceases to be a question of comparison, and becomes one of contrast. We commend these facts to the consideration alike of those who seek adequate returns on a given investment, and to those entrusted with the beneficial expenditure of that which belongs to others.

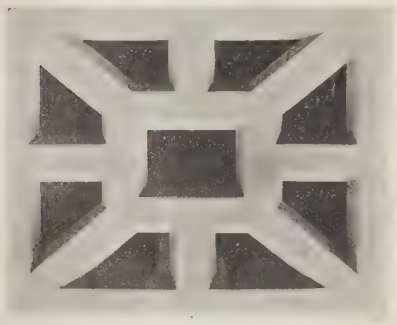


FIG. 67.

The balcony and parapet balustrading to which attention has been directed in THE BRICKBUILDER for September, as also in the foregoing illustrations, are all associated with classic, or with some phase of Renaissance architecture. For the remaining example in that class of work, a distinct type of Gothic has been selected; from which it will be seen that pierced curvilinear forms, however elaborate, are well within the capabilites of burned clay. Indeed, we may go farther and say that, in comparison with stone, the advantages in favor of the plastic material will be found in proportion to the intricacy of the design. This becomes obvious on taking the actual value of the stone in the rough, adding to it the cost of punching out the voids through a thickness varying from 4 to 8 ins. Thus far we get the subject in outline only. An expert stone-cutter has yet to mold all the members, to quirk out the intersections, and cut a variety of cinctures before it is complete. In figuring out the relative cost, it will be well to remember that, in stone, all this is done by the persistent, laborious use of mallet and chisel; finally, that the man who handles these tools is — as indeed he ought to be — one of the highest paid mechanics employed in connection with building. Gothic tracery in stone is therefore a luxury, reserved for the few who can afford it. Executed in burned clay, it comes within the reach of all builders wise enough to seek an embodiment of the artistic with the utilitarian elements of architecture, therein to be obtained at reasonable cost. Here we have the sound democratic doctrine of Mill — "the greatest good of the greatest number" — fittingly perpetuated.

In the production of pierced work in terra-cotta, whether bounded by straight or curvilinear lines, the operations just referred to are reversed from the outset. Even to cutting the profile of a molding in zinc, the part that a stone-cutter throws away as useless is indispensable to the terra-cotta maker. Mounted on a wood backing, it becomes his templet, from which the same molding is run with but little effort in a semi-fluid and very mobile material. Advantage being taken of the quick setting and adhesive properties of plaster, an equally rapid system of manipulation has been evolved. In this the expert plaster worker is guided by well-defined rules of procedure, all of which have been suggested to him from time to time by the peculiar action of the material in which he works. Chief among these is the principle of casting, wherever possible, as distinguished from carving in the solid. Hence the plaster model, no less than the mold to be taken from it, assumes the desired shape during the *process* of setting, and before the mobile mass has solidified. It may, therefore, be said that the resulting molds represent the least possible expenditure of raw material, of time, and of mechanical effort. So much for the preliminary steps of procedure; which, like the working drawings, are but well-devised instruments of service, — a means to an end, not to be confounded with the end itself.

In producing the actual pieces of terra-cotta from these easily prepared molds, the conditions are not less favorable. The raw material covers a goodly share of the earth's surface. Its abundance, variety, and wide distribution make it available for all time at a nominal cost. The facility with which it can be pressed into shape is proverbial; for here, too, the process is strictly plastic throughout. From thirty to fifty pieces may be produced from each mold, without the aid of any tool whatever, beyond the use of a man's hands. It is a fact, worthy of more than passing notice, that work such as shown in the accompanying illustrations was *not* hammered out of rock by oft-repeated blows and knocks, "but molded in soft clay, that unresisting yields itself to the touch." The last dozen words show that this easy facility of execution appealed to the poetic imagination of Longfellow no less strongly than it does to the most prosaic of practical men, to whom "time is money." To the fully equipped and qualified architect it should have a twofold significance; for in him we expect to find these qualities of temperament and training united to an extent unlooked for in the members of any other profession.

Considerations such as these, however, do not always occur to an architect engrossed, it may be, in the early stages of his project, or in time to enable his client to profit by their acceptance. When the question of cost comes up, as sooner or later it is likely to do, the man who is expected to foot the bills may have something to say. To him it then becomes a question as to whether he will pay for

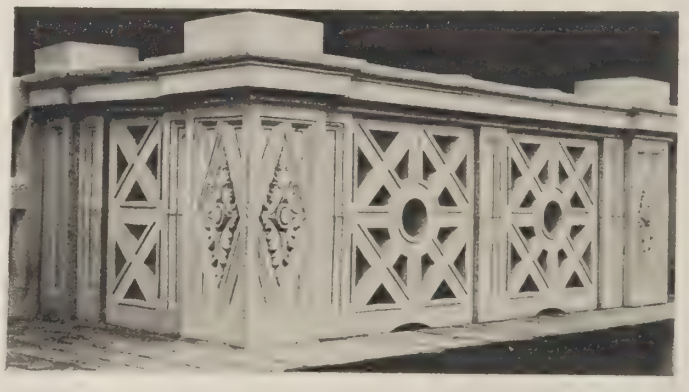


FIG. 68.

these embellishments in stone, or, perhaps, abandon them altogether. If, at this juncture, he be not guided aright through intervening doubts and difficulties by his professional adviser, a still worse fate is in store for him. He may, in a moment of weakness, rushing to the opposite extreme, perpetrate a sham in sheet metal for which he will afterwards hold his architect primarily responsible.

In the interest alike of architect and owner, we propose to show that features such as these can be executed in a material more enduring than stone, and at a comparatively low cost. These fundamental facts are becoming known to our leading architects, and, which is

more to the point, are being put to the test with results that must, in the nature of things, create an ever-increasing demand in quarters where it did not formerly exist. While enlarging upon the duties and responsibilities of architects, it must not be forgotten that those resting upon the manufacturers are not less urgent and exacting. They were outlined somewhat freely by the present writer in the first of these papers (BRICKBUILDER, May, 1895), in words that have not lost their original meaning because of anything that has happened since they were written. We shall take the liberty of reprinting them without transposition or abbreviation.[1]



FIG. 70.

In this connection, we would call special attention to Figs. 69 and 70; one showing the construction, the other a view of three pieces of Gothic balustrading, set together to illustrate the preceding diagram. It will be seen that the shaft by which these two alternating designs are, apparently, separated is made to lap in such way as to unite them, at the same time rendering the one and only joint practically invisible. In short sections the diagonal stays would not be needed; but as this was one of considerable length, they were added as a safeguard against lateral vibration. The spacing of these sections was, of course, fixed arbitrarily by the design, but the jointing and general construction were entrusted to the terra-cotta manufacturer. They might — by some makers would — have been subdivided into an aggregation of small pieces, on the erroneous supposition that this would mean less risk and less responsibility. That notion, originating in the unfortunate experience of some who are no longer engaged in the business, is far too prevalent, and though the originator may have passed from the scene of activity, the impressions so created survive with characteristic perversity. Misinformation of this kind has given rise to needless misconception on the part of architects, and is still highly prejudicial to the use of terra-cotta in general. It has been truly said that "time makes more converts than reason"; yet we have hastened to correct some of these false impressions, and shall continue to do so as opportunity permits, trusting to time for much that we must necessarily fail to accomplish. A learned writer has justly remarked that, "He only can rightly guide others in the paths of knowledge, he only can know whether his predecessors went right or wrong, who is capable of a judgment independent of theirs."

We know that "a long habit of not thinking a thing wrong gives it a superficial appearance of being right"; therefore, a few facts bearing upon the present example may help to remove the débris of some antiquated and exploded notions to which far too much credence has been given. In dealing with it, it will be seen that an opinion, altogether at variance with that indicated in the preceding paragraph, prevailed as to jointing from the outset. This work was made in *single pieces*, not because the architects had made any stipulation in that direction, nor yet as an empiric test of an abstract theory, but voluntarily, advisedly, and by preference. First: Because it is incomparably better to have it in that way, not only on the score of appearance, but also on the grounds of simplicity in setting and because of its greater stability once it has been set. Second: We are prepared to affirm that it will cost less, when made in the way indicated, than it would if jointed into smaller pieces. Third: Rational methods being adopted, the risks attending the manufacture of reasonably large pieces are reduced to a minimum — we might almost say a minus quantity. While these facts are sufficiently conclusive, it may be added that beyond the exact number of pieces called for, it was not considered necessary to make an "over"; nor was one required. As in larger blocks, previously described, these came from the kiln without a flaw. With hundreds of successful examples in reserve, we invite the attention of architects and owners to what has been said on behalf of advance practise, in which the bugbears of other days have become obsolete.

A pertinent observation left on record by Bacon occurs to us at this point, — one that is capable of a wider application than its author intended: "The amount of ill-written literature is not diminished by ceasing to write, but by writing others, which, like Aaron's serpent, shall swallow up the spurious." So, too, the amount of ill-constructed and poorly made terra-cotta is not improved by allowing men who are notoriously blind to constitute themselves leaders of the blind, but by producing work the superior excellence of which will force them to seek a less hurtful way of obtaining a livelihood.

From pierced double-faced balustrading to geometrical tracery is but a step, and the transition in such a case naturally suggests itself. What is practicable in the one is equally so in the other, for the prevailing conditions are identical. Nearly all that has been said in reference to the former will hold good in the latter case, and, so far as it goes, may now be emphasized without being repeated. There may be an opportunity during the coming year in which to say something on church architecture in materials of clay. In that case, a more extensive use of terra-cotta tracery will be urged in the

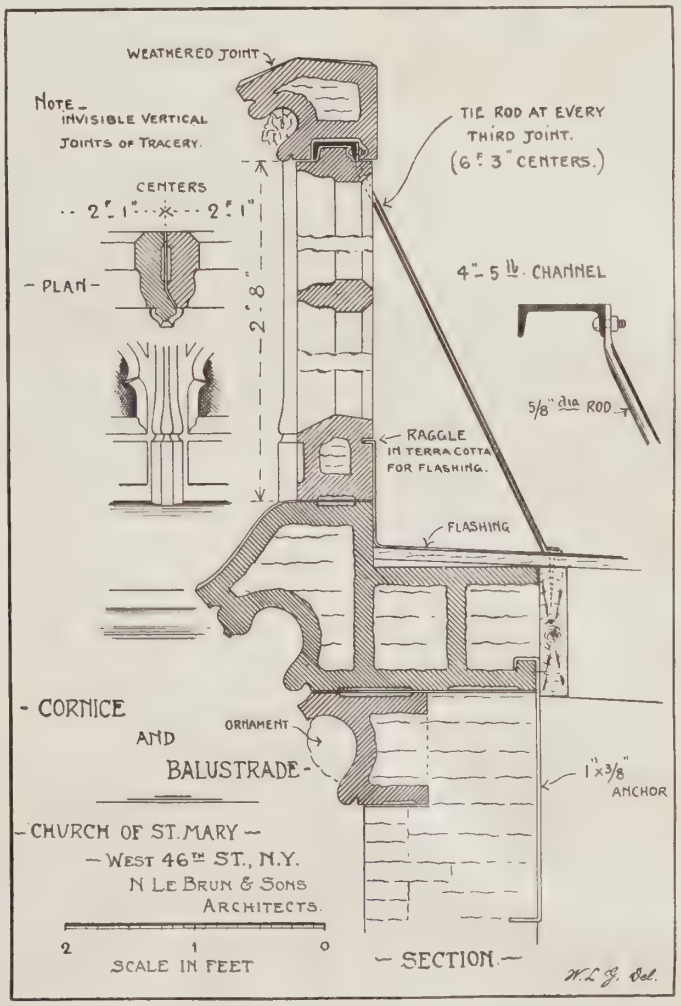


FIG. 69.

light of accompanying illustrations; none of them formulated in support of new-fangled theories, but all taken from recently executed work, or from that which is entitled to yet greater respect, because of its survival in the face of time and the elements.

[1] Badly made terra-cotta is bad for everybody, irrespective of who bears the odium of being its godfather. By the same rule, a well-done job is a universal benefit, no matter who may be entitled to the credit of having stood sponsor for it. The better the work, the more will it be used and the wider will be the advantages that accrue. Thus does the question become one of public concern. Its enemies are of its own household. It lies with the manufacturers of terra-cotta themselves, more than with any other part of the community, to hasten or retard its manifest destiny as the popular building material of the future.

An Example of Fire-proof Church Architecture.

TO THE PUBLISHERS OF THE BRICKBUILDER: — I have experienced much gratification in having found in my own city a building in course of erection in which fire-proof material is being used in the main structure of a work of art, without in any way violating the traditional usages of the greatest period of historical



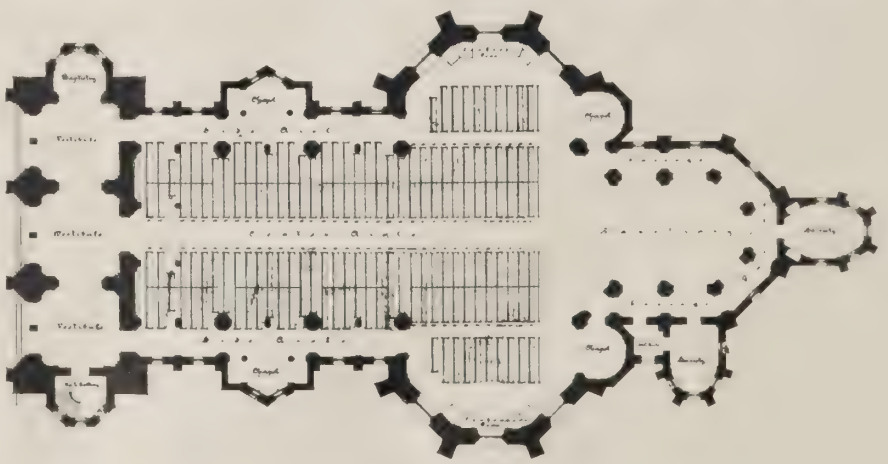
ST. PAUL'S CHURCH, CHICAGO.
From Plaster Model.

architecture. It must be confessed that in many respects the discussion of the problem, how to make buildings fire-proof, has little in it to satisfy esthetic aspirations, and unless it can point the way to a realization of that which will satisfy the eye as well as utilitarian needs, it soon becomes a dull subject as well to the average reader as to the writer. But when a fire-proof material becomes the essential part of a beautiful building, fire-proofing may well be recognized as a fine art as well as a science. It was with these thoughts that I first beheld the new St. Paul's (R. C.) Church, now about half completed, and concluded that it was destined to be the beginning of a fire-proof architecture in every sense of the term, and consequently an object of interest to the readers of THE BRICKBUILDER.

This church is located on the southwest corner of Hoyne Avenue and 22d Place, in a quarter west of the lumber district mainly inhabited by a poor but industrious class of mechanics of German birth from the Rhine and Moselle provinces. The pastor of this flock is Rev. G. D. Heldmann, a native of Chicago. He was the founder of the parish. The architect and master of all the work is Henry J. Schlacks, also a native of Chicago, and now in his thirty-first year.

This church has reached the full height of the main walls, and the steel framework of the roof is in course of erection. It is designed and built according to the distinctive characteristics of thirteenth-century church architecture, and the material, wherever possible to use clay products, is *brick*, both outside and inside; whether for walls, groined ceilings, roofing material, interior finish, terra-cotta ornamentation and tracery, or flooring: all is some product of clay. The only exceptions are a granite water table surrounding the whole building (for it is a finished work on all sides), I-beams and concrete arches for the floor, small granite shafts with capitals and bases between the main vaulting piers, and a steel structure to support the tiled roof. There will be no wood, and consequently nothing to burn in the structure or finish, and all the seats and furniture will be movable. The doors will probably be of bronze, while the windows, the designs for which are yet to be decided upon, will be the best product of American artists in stained glass, set into the grooves of the terra-cotta tracery. It is only to be added that the pressed brick of the exterior and interior, most of which is molded (the same forming all the ribs and groins of the vaulted ceiling), is all fire brick, at which point my description of the fire-proof qualities of this edifice ends, and as such it is as nearly perfect as possible.

Other interesting facts will be given in the words of the architect, which I have solicited, as follows: "In December, 1896, Father Heldmann came to me and said he wanted to build a new church during the year 1897. We discussed the needs of the parish, and he asked me to make preliminary studies, which I did along conventional lines, occupying about three weeks, but not to my own satisfaction. We then discussed the possibility of building a church which would appeal to the affections of the people of the congregation by presenting something similar to those churches they had seen in the old country. They had mostly come from the valley of the Moselle, where the churches, which I had fortunately seen, had rough interiors, never intended to be plastered. At first we decided to build a church similar to the Cathedral of Treves, but on account of the great cost of finishing the interior with stone, the idea of building the whole, inside and outside, of brick was suggested by me. A brick interior was a novelty to Father Heldmann, though I knew they were doing it in Germany, and remembered particularly the success of this kind of building by Prof. Johannes Otzen, of Berlin. I therefore decided at that early stage of the program to follow in his footsteps. I also decided if possible to have the building vaulted with brick, which I believe has not been heretofore done with church edifices in this country. Of course, the scheme was to avoid all necessity for plastering, and this made it still more difficult. The plan was then settled upon, that is: that the church should be cruciform in shape, with very narrow



FLOOR PLAN.

aisles, to be used only for passage and processionals, leaving the nave unobstructed, and an ambulatory around the sanctuary. It was to have a large vestibule (narthex) vaulted, with organ loft, but no other galleries, two side chapels on the aisles, and two sacristies,



VIEW FROM THE NORTHEAST (OCTOBER, 1898), ST. PAUL'S CHURCH, CHICAGO.

the second one being behind the sanctuary, to connect with the cloister and pastor's house, to be hereafter erected, and a baptistry connected with the vestibule. When the scheme of brick construction for the interior was practically and satisfactorily settled, the exterior presented a very difficult problem, that of combining the two towers and the auxiliary chapels that Father Heldmann wanted, with the style of architecture we had chosen for the interior. But I found my motive for the towers in the Cathedral of St. Cortin, at Quimper, France, which I had always greatly admired. I hold that an architect should always go to examples of a perfected style and work upward, if possible, from them, and not trust too much to his own invention, and I think that in this opinion I am upheld by the best men in the profession. By so doing we are following in the footsteps of the best precedents we have. All the best architecture of the Middle Ages was evolutionary; everything was a slight improvement on something that had preceded it.

"We then determined to erect the building without the intervention of contractors."

"Why did you conclude to adopt that method?" I asked.

"Because we could find no builder in Chicago acquainted with the proposed method of construction, or who could give even an approximate estimate of the cost from my plans. At a meeting of the building committee, when these obstacles to a successful carrying out of the plans were discussed, the committee voiced the sentiments of Father Heldmann, expressive of his confidence in the architect, by deciding to let him carry out the work in his own way. There are many members of the congregation skilled in the different building trades, and this, together with the fact that at that time there was a general dulness in the building market, induced me to decide that, as far as possible, the parish should supply all the labor at current rates of wages, so that in many cases what a man contributed might come back to him. This has been done, and with great success. It has aroused an interest and enthusiasm in the parish that would not otherwise have existed. As for the materials, we contract for them or buy them in the open market.

"I was given all the necessary time to prepare the plans, being not otherwise engaged at that time, and before the foundations were designed I had borings made on the site. These resulted in the surprising fact that there was rock under the church at a depth of only twenty feet below the street grade. I then decided to carry all the main piers and buttresses down to the rock, the intermediate walls being carried on arches. I also became confident that I could successfully build the whole church with a vaulted ceiling, as I would have no fear of settlement. As a result, we have had no anxiety whenever we wanted to change the loads. The pier foundation, however deeper it may be than if it had been on clay, was much less expensive.

"My principal drawings were completed during the winter of 1896 and 1897, and we were able to commence the work in May, 1897. At that time I was fortunate in being able to procure the services of Mr. Paul F. P. Mueller, as superintendent of construction, his connection with a building company having been broken off very suddenly. He has since had entire charge of the work on the building as my assistant, purchasing material and employing men, for which his previous education in the best building school in Europe, no less than his large experience in this country, has fitted him."

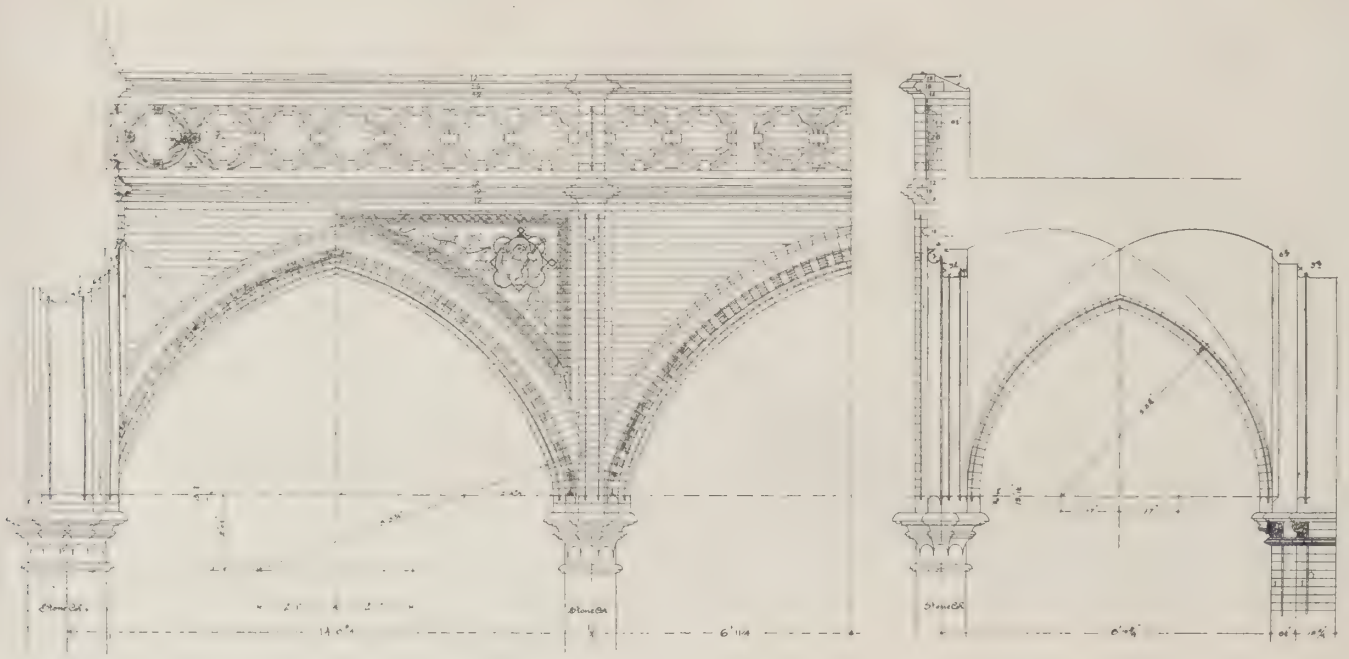
Mr. Schlacks gave many more interesting particulars of his experience, too extensive to be here repeated.

I have also had a very interesting conversation with Father Heldmann, which I wish you had space enough to print in full, for it would be an admirable lecture, not only to architects, but to clergymen of his church. So I will give only its general tenor. He said he had always been dissatisfied with the meretricious ways in which Catholic churches had been built, and had made up his mind that if he ever built a church, it would be worthy to be called "the house of God," and should be an honest creation. His observation of what others had done had led him to learn what to avoid, but he had never had an opportunity to go to Europe and study either the perfected cathedrals of the Middle Ages or some of the modern churches he had heard of. He had, however, been reminded by Mr. Schlacks of the successful work of Professor Otzen, in Berlin, which made



INTERIOR, LOOKING TOWARD ORGAN LOFT (OCTOBER, 1898), ST. PAUL'S CHURCH, CHICAGO.

him think that he might be able to do as well. When he had accumulated sufficient funds to make a beginning, he and Mr. Schlacks had made a journey through most of the large cities of the



DETAIL OF ARCADE BELOW ORGAN GALLERY, ST. PAUL'S CHURCH, CHICAGO.

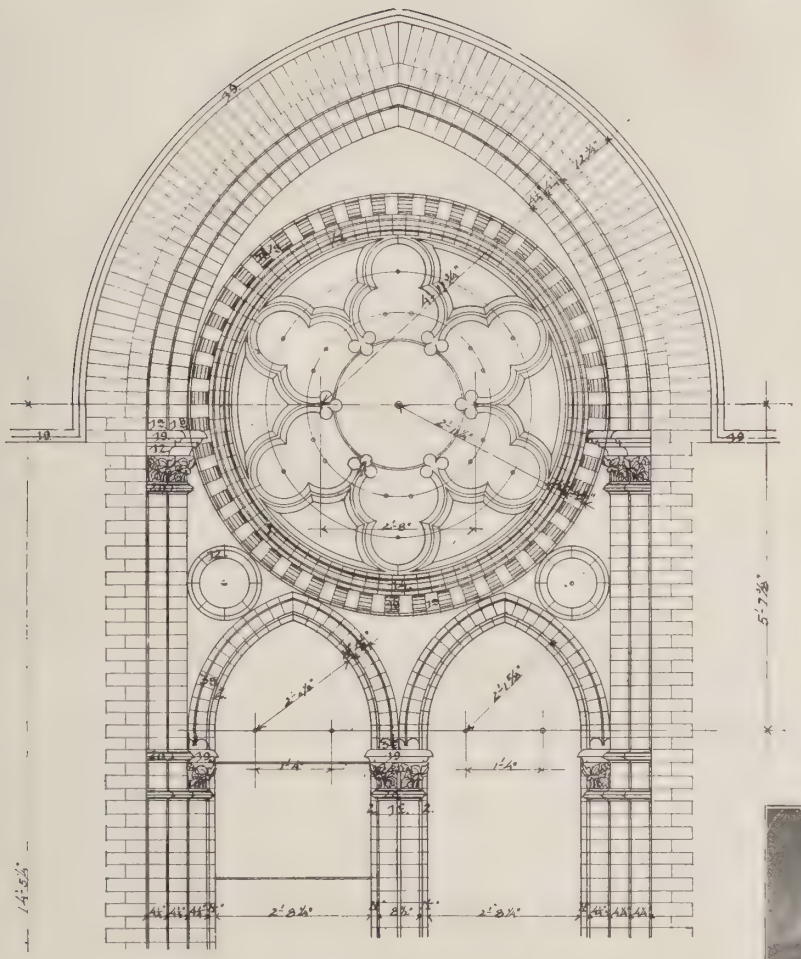
United States, East and West, to see what others had done. They visited hundreds of churches, not confining themselves to those of the Catholic denomination, and he was struck with the contrast between some of the churches of the Episcopal denomination and those of the Catholic. He said there was a sincerity of purpose in the Episcopal churches, and a truly religious character in their architecture, materials, and construction, that he had failed to see in the American churches of his own faith. This is not different from the opinions held by many thoughtful architects. He was struck, not only by the unsubstantiality of modern churches, but their liability to be destroyed by fire. He had always had a dread of fire since the great event of 1871 in Chicago, which made a strong impression upon him in youth, and thought that the way churches were generally built betrayed a great negligence in dealing with sacred things. To combat this, and at the same time secure economy of cost, a course which has since been justified by results, it was decided that the new church should be of brick, outside and inside, so far as possible.



INTERIOR OF ST. PAUL'S CHURCH, CHICAGO, LOOKING TOWARD ORGAN LOFT.
From Water Color.

The rest he left to Mr. Schlacks, in whom he had found an echo of all his longings and desires. It was in seeking the best color of brick to satisfy the eye that they had chosen a rich buff fire brick, which proved to be the cheapest that could be found to fulfil all the requirements, such as color, fire-resisting qualities, and the necessity of being made in a great variety of shapes, so that it could form continuous moldings. He hoped that his new church would not only be an educator for his own people, but would become an object lesson to all who might come after him. He could not speak too highly of Mr. Schlacks, who has devoted nearly his whole invaluable time to the work, and who was in entire sympathy with him in his aspirations.

A few statistics will be necessary to make this description complete. The outside dimensions are as follows: width over towers, 76 ft. 4 ins.; width over transept, 103



DETAIL, WINDOW OF NAVE, ST. PAUL'S CHURCH, CHICAGO.

ft.; length, 183 ft.; length, including sacristy, 203 ft. The heights are: from floor to under side of nave vaulting, 65 ft.; from floor to under side of transept vaulting at center, 73 ft.; sanctuary vaulting, 58 ft. The interior dimensions are: width of nave to axis of piers, 42 ft.; width, including aisles, 59 ft. 6 ins.; width at axis of transept, 93 ft. The height to ridge of roof outside is 100 ft.; the two towers are each to be 245 ft. high. A terrace 1 ft. 6 ins. high above the sidewalk surrounds the whole.

The pressed brick and molded brick are made by the Webster Brick Company, of Webster, Ohio. The plain faces of exterior walls are of common brick. When completed, the entire interior walls and piers will show Webster brick, of which also all transverse wall arches and groins of the ceilings will be made. The wide splay of the chancel arch, and a similar splay to the arch over the organ gallery, as well as all spandrels of arches and panels now shown on the walls as common, will be filled with glass pictorial mosaic on gold grounds. The vaulting cells forming the filling in of the groined vaulting are of three thicknesses of flat tiles set edge to edge. The first course forming the ceiling is of 6 by 6 by ¾ ins. nearly white porcelain tiles, with borders next to the vaulting ribs 6 ins. wide of encaustic tiles of the same size, in colors, so that the whole ceiling will be decorated. The two outer courses are of ¾ in. fire-clay tiles. The sculptured "eyes" in the vaulting and capitals of all colonnettes in the interior are of terra-cotta, made similar in color to the brick. All the vaulting is quadripartite and domical, thus avoiding all such *tours de force* of the medieval builders as have mystified some modern critics. All exterior terra-cotta, consisting of the window tracery, crockets, finials, copings, and crosses, are of similar terra-cotta, used, however, only where it has been impossible to use brick. Many of the pieces, especially for interior work, where subjected to great pressure, are cast and burned solid. All of this work is furnished by the Northwestern Terra-Cotta Company. The floor will be finished with encaustic tiles laid on the concrete arches. All exterior walls are hollow. There is a deep basement under the whole, which will be utilized by the heating and ventilating apparatus. This will, by regularly changing the air within the church, prevent all danger of sweating during the warm days of spring. The roof will be covered with Ludowici red tiles, made in Chicago, similar to those on the German Government Building at Jackson Park.

No metal or wood will enter into the construction of the twin spires. They will be built of brick, the walls being 12 and 8 ins. thick, and the crockets and crosses of terra-cotta.

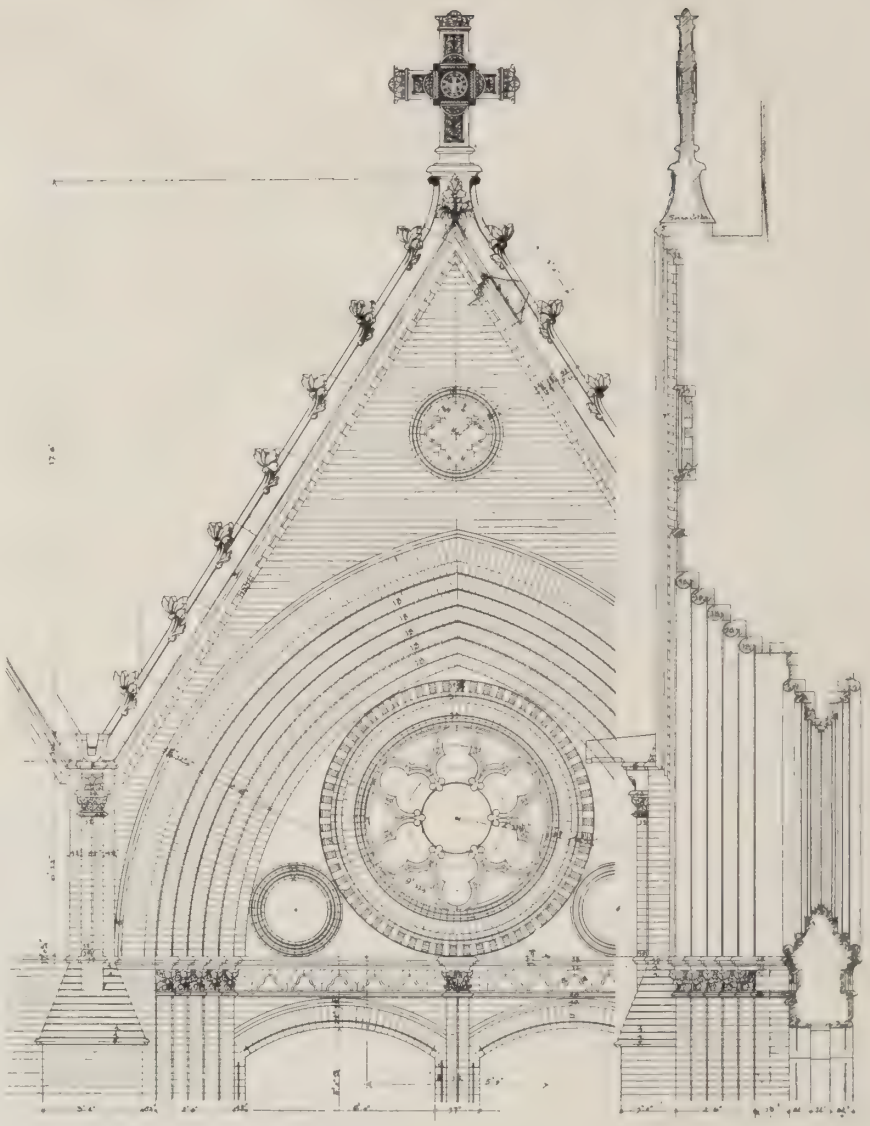
In conclusion, let me say that the chief interest that attaches to this remarkable building is, not so much that it is an example of good architecture, truthful construction, and moreover thoroughly fire-proof, or not even because it is a wonderful example of construction with brick; it might not be either of these were it not for the fact that it is an architect's building and not a contractor's building. Or it might be said that it is a builder's building, and the builder was also the architect. It demonstrates that what was done in the twelfth, thirteenth, and fourteenth centuries can be done in the nineteenth, in the same way, and with the same results. The whole work is a labor of love from beginning to end. The modern commercial idea is entirely obliterated. What is more, it has proceeded far enough to demonstrate that this method is the most economical in



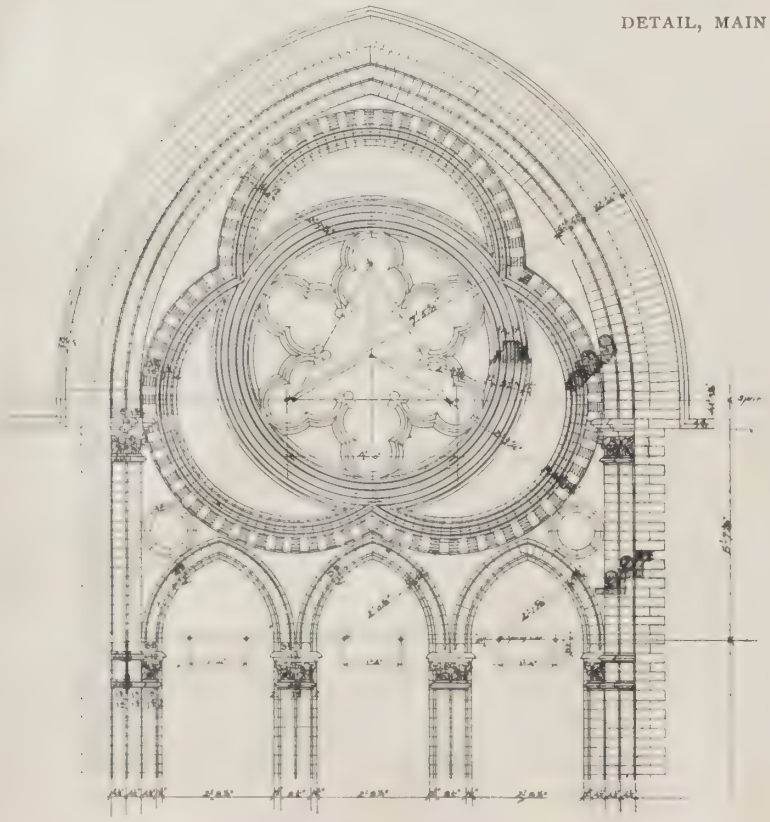
INTERIOR OF ST. PAUL'S CHURCH, CHICAGO, LOOKING TOWARD SANCTUARY.
From Water Color.

practise, and gives the largest results for the least cost. The wildest estimates have been made by outsiders of what it will cost. Those who are building it know now what this will be, but I will not attempt to repeat their figures. It does not concern the public.

The illustrations that I have procured consist mainly of one exterior and one interior photograph of the work in its present condition. The latter shows the method of interior construction and the groined vaulting over the organ gallery completed. It also shows the wall arch above it of 40 ft. clear span standing free. Mr. Schlacks had this built to satisfy some of the congregation that he could do it with safety; and it has stood without any other support for a month past. Another view is from the plaster model showing the completed church from the northwest, but much of the detail has been changed since it was made. The method of building admits of improvements in the design being made as the work progresses without extra expense. There are two interior views from drawings showing the completed building; also photographs of one of the crosses for the front entrance and one finial. Besides these I send you a ground plan and some of the detail drawings of the brickwork that are well worthy of study on the part of those who are interested, especially in the construction of window tracery with terra-cotta. PETER B. WIGHT.



DETAIL, MAIN ENTRANCE, CENTER OPENING, ST. PAUL'S CHURCH, CHICAGO.



DETAIL, WINDOW OF TRANSEPT, ST. PAUL'S CHURCH, CHICAGO.

PRESERVING RECORDS OF FOUNDATIONS.

THERE are foundations and foundations, and though the average builder's foreman will be very ready to declare that earth that looks solid will hold, in an expressive phrase, all that you can put on it, every one who has studied foundations knows that the contrary is very often the case. We have seen bottom which had every appearance of being the hardest, firmest kind of dry, gravelly clay, but which upon investigation proved to be simply a thin layer of such clay over a relatively soft and yielding earth.

The practise ought to be rigidly adhered to of always sinking test pits before laying the foundations of a heavy building. It is a simple thing to have borings made to a depth of 20 or 30 ft. below the sidewalk, and there ought to be below the bottom foundation a layer of suitable bearing stratum at least 5 ft. thick, and of course the thicker the better. Furthermore, it is a wise precaution to not only have the borings made, but to reserve samples of the soil, and when the trenches are dug it is a good idea to have careful photographs taken from one or two points so as to show the character of the soil. This may prove very useful in case of subsequent additions or changes in the building, especially if such changes involve added loads. Also in large city buildings, when one structure is to be carried down below the adjoining cellars, it is well to take very careful photographs and measurements of the existing adjoining foundations, which are very often found not to be as secure as the neighbors imagined. These photographs, together with samples of the actual earth taken from several points about the building, would form valuable data to which the constructor could refer with perfect confidence.

PHYSICAL TESTS OF PORTLAND CEMENT.

BY CLIFFORD RICHARDSON.

As with the natural cements, we are accustomed to judge of the character of various kinds of Portland cement by certain physical tests as well as by their chemical composition.

In the following table are given the results of the physical examination of certain specimens which illustrate the various types of high-grade Portland cement now found in our market and recently tested in the author's laboratory.

PHYSICAL TESTS OF THE BEST BRANDS OF PORTLAND CEMENT OF VARIOUS ORIGIN.

Country.	German.	Danish.	English.	Belgian.	American.	American.	American.
Brand.	Germania.	Alsen.	Brooks & Shoobridge	High Grade.	High Grade	Ordinary.	Ordinary.
Residue on 200 mesh .	25.9	21.0	23.0	23.0	14.0	23.6	6.8
" " 100 "	6.0	4.0	7.0	10.0	1.5	6.8	.8
" " 50 "	trace	trace	1.0	1.0	trace	.8	.2
Set, initial	3 hrs. 25′	3 hrs	1 hr. 45′	3 hrs.	4 hrs. 25′	2 hrs.	25′
" hard.....	7 hrs. 40′	7 hrs.	3 hrs. 15′	6 hrs.	6 hrs. 20′	4 hrs. 45′	1 hr.
Water for neat mortar	20%	20%	19%	20%	19%	19%	20%
" " sand "	10%	10%	9%	10%	9%	9%	9%
Tensile Strength:							
Neat, 1 day.....					376	260	350
7 days	656	560	596	626	840	496	790
28 "	687	666	464	638	974	678	
3 months					946	740	
Quartz, 3 parts:							
7 days.....	160	282	120	226	280	162	364
28 "	230	262	192	306	314	218	
3 months.....					494	244	
Crushing Strength:							
Neat, 7 days.....	5,458	6,056	4,725	5,091	10,280	5,500	4,950
28 "	6,695	6,761		7,256	11,822	7,412	4,400
3 months.....					13,250	5,787	
Quartz, 3 parts:							
7 days.....	1,659	1,321	634	1,601	1,762	1,042	2,137
28 "	1,700	2,157		2,142	2,990	1,712	2,500
3 months.....					2,923	2,100	

The results of the preceding tests show that the Portland cements are distinguished from the natural cements, in addition to differences in characteristics which have already been mentioned, by their slower set, except among some of the inferior brands, and their more rapid acquisition of strength, which is largely completed in from seven to twenty-eight days, although continuing to increase for a year or more. Mortars made with Portland cement are much denser and less porous than those of natural cement, due to the greater specific gravity of the cement itself and to the smaller volume of water required.

Amongst themselves the various brands of Portland cement differ very considerably, especially if the inferior Belgian, English, and American cements are included, and more so than would be expected where the limits of composition are so small. The best German Portland cement can, without doubt, be taken as the standard of what is most desirable. When such a cement is mixed with three parts of standard sand it yields a mortar which, according to the requirements of the Association of German Cement Manufacturers, should have a tensile strength of over 227 lbs. per square inch and a crushing strength of 2,275 lbs. per square inch in twenty-eight days, when preserved one day in air and twenty-seven in water of normal temperature. Generally much higher results are obtained in Germany, as may be seen from the results of a test of a sample of German Portland given by Professor Tetmajer, which are as follows: —

SAND MORTAR. 1 TO 3.

	Tensile.	Crushing.
7 days	318	2,824
28 "	398	4,082
3 months	434	4,228
7 "	443	5,004
1 year	605	5,429

Most of the German cements found in our markets fail to reach the high standard, especially of crushing strength, seen in this sample, but the best ones reach the limits which have been mentioned, while the highest grade American cements frequently exceed them, except in crushing strength. The lower results obtained here are very largely due to the differences in the methods of testing employed in the two countries, and not entirely to the nature of the cements themselves.

American cements in some cases have an excessively high tensile strength at early stages of the hardening process without increasing in strength after a few months, or even deteriorating after that time. This seems to be a peculiarity of the rotary furnace cements, while those burned in kilns are more like the similarly prepared German and Danish products, which gain their tensile strength more slowly, but continue to do so for a long time without reverting. It is plain, therefore, that a cement giving the highest results in tensile strength, especially in the neat form, at an early age, may not be the strongest in this respect after longer periods of time. It will be noticed, however, that the results obtained in tests of the same cement for crushing strength in the form of sand mortar may continue to increase when there is a decrease in the tensile strength and crushing strength in neat mortar after some time. The importance of long-time tests and of determinations of crushing as well as tensile strength are, therefore, apparent in judging of the character of any particular brand.

Our Portland cements are quite as well ground as those which we import, and often are much finer, in the best brands over 80 per cent. passing a sieve of two hundred meshes to the inch and from ninety-five to ninety-eight passing a one hundred mesh sieve. Considering the increased value of finely ground cement, this is an important consideration.

VOLUME CONSTANCY OR SOUNDNESS.

An important determination and consideration in judging a Portland cement is whether it is sound and will not change its volume on age and exposure, losing, at the same time, its strength and coherence. This is usually considered in making tests of cements. It appears from the results of our experiments that many second and third grade cements are not satisfactory in this respect, as some of them check and deteriorate under the conditions of the test. A good Portland cement should show no signs of deterioration in sand mortar even after considerable periods of time, and although it is impossible to always wait for long intervals to settle this point, there are forms of tests which can be so accelerated as to give a result from which more immediate conclusions may be drawn, and it is important that these tests be applied. The best brands, both of foreign and domestic cement, generally prove satisfactory in volume constancy, and when preserved in the form of pats with thin edges for a long time in water, or when the test is accelerated by heat, seldom show any signs of cracking or checking. As the supply of cement of such a quality is plentiful it seems undesirable to use any that will not pass the test, although it may prove unjust in a few instances if applied severely. The methods of making the tests we shall describe later.

EFFLORESCENCE on brickwork may, according to Professor Günther, of the University of Rostock, England, "come either from the bricks or from the mortar. While incrustations of calcium carbonate do no harm beyond spoiling the appearance of the work, soluble alkali salts repeatedly dissolve and recrystallize in the cracks, ultimately producing disintegration. To prevent these incrustations, pyrites and sulphates can either be removed by the slow process of seasoning the clay by prolonged exposure to the weather before making up into bricks, or by adding barium salts to the clay before burning, so as to produce the insoluble barium sulphate. Another remedy is the prevention, in continuous kilns, of the oxidation of the sulphur present in the clay or coal beyond the stage of sulphurous acid; which may be effected by limiting the air supply. Finally, the bricks should be very thoroughly burnt, since in this state they are less disposed to absorb the moisture necessary for the extraction of the soluble salts." — *Eng. Record.*

Masons' Department.

SOME MISTAKES OF CONTRACTORS AS VIEWED BY AN ARCHITECT.

BY F. E. KIDDER.

(Continued.)

THE writer is now supervising the completion of a building, the architect of which lost his health soon after work was commenced, and died when the building was about half completed. When the first bids were received they brought the price beyond the amount available, and the architect endeavored to reduce the cost by omitting some portions and changing the materials.

As the work has progressed much annoyance has arisen from the contractors claiming that they had certain verbal agreements with the architect which were not incorporated in the plans and specifications nor mentioned to the building committee. One subcontractor claims that to do the work according to the plans, specifications, and details will cost him three hundred dollars more than what he figured on doing. The writer, as superintendent, has only the plans and specifications to govern him, and, of course, the owners expect him to see that the work is executed in accordance with them.

Nothing having been said to the building committee about any of these changes, they naturally believe that none not shown on the plans were contemplated. Consequently, the contractor must comply with the drawings and specifications or forfeit his bond.

This is mentioned for the purpose of illustrating the importance of having everything in "black and white." It is true, a great deal of business is done on verbal contracts, and often without trouble, but it cannot be said to be a safe way of doing business, and, as a rule, is wholly unnecessary; even if the parties concerned are perfectly trustworthy, life is very uncertain, and death may bring about unexpected situations.

If the tracings, when handed to the contractor, are not in accord with the drawings on which the contract is based, or with the specifications, then is the time to require that they be corrected, and not after the work is commenced.

When once the work is under way it is poor policy to complain that more is required than was figured on, or that he, the contractor, has taken the work too cheap. Such complaints seldom do any good, and often injure the reputation or standing of the contractor.

Building contractors are also often very careless in making contracts with one another; the usual contract being merely the verbal acceptance of a bid, and even the latter is not always put in writing, or if in writing, not in a proper form. It has always seemed to the writer, that of all business men, building contractors and subcontractors are the most careless about their business affairs. This is probably due, largely, to the fact that they are generally pretty well acquainted with each other, and have, perhaps, done business together several times in this loose fashion with satisfactory results. Then, too, writing materials are not always at hand for making a contract, and the amount is simply jotted down in a note-book, and the rest left to a verbal understanding or to custom.

Again, many people, and they are not all contractors, appear to have the idea that to request a written contract or a written order implies distrust. This certainly does not follow, as even where both parties to a business transaction have the highest sense of honor, there is often a chance for a misunderstanding, or one party may have in his mind something different from that in the mind of the other, which, when the contract is put in writing, would be brought out. Again, in making a verbal contract one is liable to forget some important provisions or conditions which would not be so readily overlooked in making a written contract. No honest person can object to put in writing that which he has promised verbally, and in case of the failure or death of either party, a written contract will save many complications. Even written contracts are sometimes interpreted differently by the different parties thereto, as the writer has found in his own experience, but they are far more satisfactory than verbal ones.

The contracts between contractor and subcontractor need not be as elaborate as that between owner and contractor, the principal points to be defined being the money consideration, terms of payment, what is to be done and when it is to be done, and that it is to be done according to the plans and specifications. A contract embodying these points with sufficient clearness can be printed and put up in pads, of a size that can be carried in the pocket, and an indelible pencil or fountain pen can be used for filling them out. The written acceptance of a bid, if the bid embodies the points above mentioned, usually makes a sufficient contract, especially if the bid allows a fair profit on the work. It is in those cases where the work is taken at too low a figure that a contract is most necessary, at least to the general contractor.

Another serious mistake often made by contractors is in causing the architect unnecessary trouble, annoyance, and loss of time. We believe that nearly all contractors will admit that the good-will of the architects is of some financial value to them, and yet many contractors act as though it made no difference to the architect whether the work drags or not, or whether he has to send for the contractor several times to finish up his work or to get it ready so that other workmen may proceed, or has to settle disputes between the different contractors over some trivial matter.

The architect receives, practically, a fixed price for his supervision of the work, and if he has to visit the building for six months, when the work might as well be done in five, his expense of time and labor is increased 20 per cent. He cannot, therefore, be expected to desire a contractor to do his work that will make his own services expensive and laborious.

Some contractors, and more foremen also, often have the very annoying habit of urging some different way of doing the work from that shown or specified, and of haggling over little things, and some are even fond of advising the architect as to what will look best and how he might improve his design by making certain changes.

Both of these habits are not relished by architects, and the writer believes result in a financial loss to the contractor, through loss of work and favors that might otherwise, perhaps, be extended. Contractors also often lose the favor of both architect and owner by their utter unconcern as to how the subcontractors under them do their work, and as to the materials which they supply. It is true that, in a great measure, the general contractor makes no profit on his subcontracts, and many apparently think that for this reason it is no concern of theirs how the subcontractor does his work, provided it does not interfere with their own branch of the work, and manages to pass with the architect. This certainly is a mistaken idea, especially as it costs the general contractor little, or nothing, to keep a supervision over the different branches of the work and have them done right, thus securing a better building and saving the architect or his representative much trouble and annoyance. Contractors that do look after their subcontractors in this way stand much better with architects and owners, and are very likely to get a preference on account of it; they certainly are more likely to be invited to bid on work, while if they are notably negligent in this respect, they may not be given an opportunity to figure on another job, in the same office, at least.

The writer does not mean to imply that all contractors make the mistakes herein noted, nor that these mistakes are confined to any particular line of contractors; but that one or more of them are made by a great many contractors, he knows from his own experience, while he also believes that they can in a great measure be avoided, with benefit to the contractor, the architect, and the owner.

(Continued.)

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK. — Many report that they have more business in hand now, and in a hopeful state of negotiation, than has been the case since hostilities began with Spain. However, there will be no material revival until spring, when we hope all negotiations will be ended and all difficulties settled, in which case we can confidently predict that 1899 will be a great year for architects and builders.

No one, not even the man who leans by preference to the security market for his investments and for speculative diversion, questions the superiority of New York real estate over all other forms of investment and speculation when the prices are right. This means always and invariably when the property, at the price at which it can be bought, produces reliably, year in and year out, a rental equal to the normal rate of interest on bonds. In this connection it will be interesting to watch the outcome of the four great blocks which are now on the market, located near St. Patrick's Cathedral, in the most exclusive section of the city.

This is a phenomenal circumstance, and at the same time its cause is far from being detrimental to the real-estate interests of



CAPITAL, PRESS BUILDING, PHILADELPHIA, PA.
Executed in terra-cotta by the Standard Terra-Cotta Company.
T. P. Chandler, Architect.

that region. That these four blocks in the very heart of the up-town district are in the market is mainly the result of the up-town business movement, and the consequent upward movement of public institutions.

Two of the four blocks referred to belong to the Roman Catholic Orphan Asylum, one to the Women's Hospital, and the fourth to Columbia College. The taxpayers of the city will gain by the sale of these four blocks, as they are all now exempt from taxation, and as their sale will bring at least $6,000,000 worth of property under taxation.

The last regular dinner and meeting of the Architectural League was unusually interesting. The subject was, "The Improvement of the Water Front of New York." Addresses were made by Major Wells, 71st Regiment; Captain Taylor, of the battleship *Indiana*, who received an ovation; Messrs. Greene, Burr, and Morrison, prominent engineers; Messrs. Price, Harder, Thorpe, and Tilton, architects; and Messrs. Bush-Brown and Ruckstuhl, sculptors.

Among projected new buildings are: —

Montrose W. Morris, architect, has prepared plans for two three-



CAPITAL.
Executed in terra-cotta by the Conkling, Armstrong Terra-Cotta Company.
W. H. Allen, Architect.

story brick dwellings, to be built on Carrol Street, corner of West Prospect Park, Brooklyn; cost, $45,000.

Edward Wenz, architect, is preparing plans for four five-story brick flats, to be built on 117th Street, near Fifth Avenue; cost, $80,000.

James E. Ware & Son, architects, have prepared plans for a seven-story brick and stone apartment, to be built on West Central Park, near 94th Street; cost, $125,000.

Frank W. Herter, architect, has plans for four five-story brick flats, to be built on 54th Street, near Lexington Avenue; cost, $175,000.

Geo. F. Pelham, architect, has prepared plans for a five-story brick flat building, to be built on 138th Street, near Alexander Avenue; cost, $25,000. The same architect has prepared plans for a six-story brick and stone apartment, to be built on 91st Street; cost, $90,000.

J. B. McElfatrick & Son, architects, have planned a brick theater and music hall, to be built on Seventh Avenue corner of 42d Street; cost, $50,000.

CHICAGO. — It is conceded that architects are feeling more encouraged, probably because of the increase of sketches for prospective work, although it is a fact that as for actual work begun, as indicated by the taking out of permits, statistics show 8 per cent. decrease for the month as compared with even the poor business of the corresponding month last year.

In October occurred the death of Chicago's pioneer architect. Mr. W. W. Boyington came to this city in 1853. The Grand Pacific Hotel was one of the older buildings which he designed. Among the best known of the recent buildings for which he stood sponsor was the Illinois Building at the World's Fair, and the Columbus Memorial Office Building.



TRADE-MARK PANEL, BUILDING FOR W. B. CONKEY CO., HAMMOND, IND.
Executed in terra-cotta by the Northwestern Terra-Cotta Company.
George C. Nimmons, Architect.

In the list of architects who appear to be busy is the name of F.



BUSINESS BLOCK, WALNUT STREET, PHILADELPHIA, PA.
Cope & Stewardson, Architects.

Foltz, who includes in his "now in hand" a school building, some residences, and factories.

Frost & Granger have let contracts for a $250,000 union depot, at Omaha. The exterior will be mottled brick and the roof will be tile.

Wilson & Marshall have some fine residences on their list.

Robert Rae, Jr., is the designer of an important apartment building.

A. G. Lund is designing a large apartment building, and John R. Stone is making working drawings for a row of houses.

Dwight H. Perkins and Frank L. Wright are associated architects for a new church of especial interest.

Recent happenings at the Chicago Architectural Club are as follows: Evening, October 24, "smoker," at which Messrs. Fritz Wagner and William D. Gates spoke on the subject of "Terra-Cotta as a Building Material"; evening of October 31, "Hallowe'en" night was observed; evening of November 7, W. M. R. French, director of the Art Institute, gave a lecture on "The Value of a Line." This evening was also observed as "ladies' night"; evening of November 14, "smoker," at which Paul T. Potter spoke on "Plumbing in Buildings," and Henry Lord Gay on "Sewerage Disposal in Country Residences."

PITTSBURGH. — As a rule, most of the building operations in progress at this time of the year are those which have not been finished during the preceding summer, but with our dull spring and summer there has been little to last over and work is dull, both with architects and contractors; quite a number of smaller dwellings, mostly brick, are, however, being built, but a decided improvement is looked for after the first of the year, and the general improvement in all lines seems to warrant this feeling.

Possibly the most interesting item which has been noted lately was the announcement by Mr. Andrew Carnegie, at the exercises of Founder's Day at the Carnegie Institute, that as soon as arrangements could be perfected, he would place at the disposal of the trustees a sum, probably about $500,000, to be used in making an addition to the present building. The quarters occupied by the art galleries and the museum are badly crowded, and this addition has been greatly needed; but while there have been rumors that Mr. Carnegie would build it, this was the first official announcement of his purpose.

The third annual art exhibit of the Carnegie Institute was opened to the public November 3. This has become an important event not only here but in Europe. Committees are chosen in a number of art centers, and all pictures, before they can be forwarded here, must meet with their approval. The jury of awards, elected by competing artists, consisted this year of eight American, one English, and one French artist.

The following items of new work have been noted: —

Architect C. M. Bartberger has recently let the contract for a new school building for the twentieth ward, Pittsburgh. It is to be built of brick and terra-cotta, and cost $115,000. He is also preparing plans for a large addition to the nineteenth ward school, Pittsburg; for a new school for the thirteenth ward, Allegheny; and for a new brick school at Wilmerding.

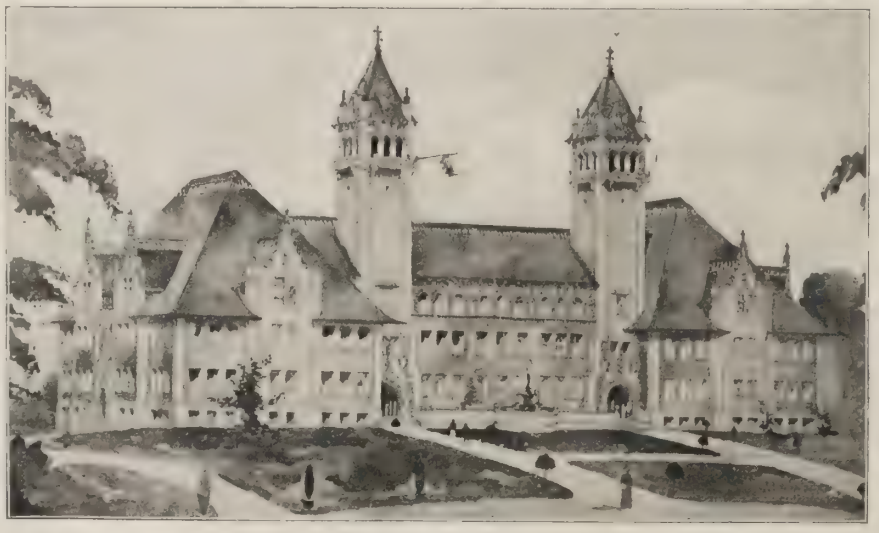
Work has been begun on the thirty-eight-room schoolhouse for the third ward, Allegheny; it is to be of stone, brick, and terra-cotta, and cost $200,000. F. C. Sauer is the architect.

Alden & Harlow have let the contracts for two branch office buildings for the Central District and Printing Telegraph Company. They have also prepared plans for a third of these buildings, to be built at McKeesport, Pa. The same architects have made plans for a new stone residence for Mr. J. G. Pontefract, Sewickley, Pa.

F. J. Osterling is preparing plans for a row of eighteen houses



PANEL, SCHOOL NO. 7, BAYONNE, N. J.
Executed in terra-cotta by the New Jersey Terra-Cotta Company.
Hugh Roberts, Architect.



SCHOOL BUILDING FOR THE OHIO INSTITUTION FOR THE EDUCATION OF THE DEAF AND DUMB, COLUMBUS, OHIO.
Richards & McCarty, Architects.



PUBLIC LIBRARY, ERIE, PA.
Alden & Harlow, Architects.

for Mr. C. L. Magee. They are to be built on Fifth Avenue, Pittsburgh.

W. J. Cast has let the contract for a new First Presbyterian Church, at Altoona, Pa.; cost, $50,000.

The exodus of the wealthier inhabitants of the down-town districts of Pittsburgh and from Allegheny seems to have stopped somewhat, and those especially who own the finer class of homes in these districts are turning toward Sewickley and the neighboring country, where many have recently bought considerable tracts of ground, and intend in the near future to build summer homes, in some cases of considerable size.

COLUMBUS.—There is being erected in this city a building of more than usual interest. It is a school building for the Ohio Institution for the Education of the Deaf, Richards & McCarty, architects.

The building is 240 ft. long by 110 ft. wide, and is practically three stories in height above a finished basement. The first and second stories and the central part of the third story will contain thirty-six schoolrooms, with a superintendent's office, cloak rooms, etc. The third story of one wing will be fitted up for a library, with reading rooms, etc., and the third story of the other wing will be fitted up for an art gallery, with studios, photographers' rooms, etc., while the large corridor connecting these wings will be used for an exhibition room to display the work of the institution. The gymnasium is in a semi-detached building in the rear connecting with the main basement. In one wing are locker rooms, showers, and a plunge for the boys, and in the other wing are like accommodations for the girls. The front part of the basement is used for chemical laboratories, bicycle rooms, and general lavatories.

The exterior walls will be faced with press brick furnished by the Columbus Brick and Terra-Cotta Company. The facing for the basement walls will be gray brick, Norman shape, and for the walls above the brick will be standard size, using gray brick for the corners and a rich buff brick for the body of the work. The ornamental trimmings will be a gray sandstone to match the color of the brick.

CERAMIC MOSAIC *v.* MARBLE PAVEMENT.

BY H. C. MUELLER.

THERE is a popular idea that nature never does things by halves, that when she produces a good material it is very nearly perfect for its purpose. As a matter of fact, however, few of the natural products used in building operations are perfect or uniform in their quality, and this applies with special force to the marbles which are used very frequently and with most gratifying success in an artistic sense for pavements and floorings. There are a few marbles which are excellent, and mosaics of marble as well as marble tiling have been used for a long period, replacing in many instances the encaustic floor tiles. If we may judge, however, by the continual search after something which shall be better than the marble, it is fair to assume that marble is not perfectly satisfactory, and all the indications point to decided superiority in some respects on the part of mosaic and tile work manufactured from burnt clay.

Within the past few years a tendency has been developed to substitute very largely the artificial for the natural product. This has shown itself principally in the East and in large cities where marble mosaic is extensively used. It has been found that the substantial appearance of the marble mosaic is deceptive, and that the work is not as strong as it seems. The patching of costly marble mosaic work is not an uncommon occurrence, and it is especially found that the wear, even under the best circumstances, is apt to be uneven, and that this is not obviated entirely by using a single apparently even quality of marble, as in a lot of marble blocks the quality will vary. Furthermore, under many circumstances, it is almost impossible to keep the marble mosaic perfectly clean, and though marble answered the purpose amply for the houses and temples of the Greeks and Romans and



DETAIL OF FRONT, PUBLIC LIBRARY, ERIE, PA.
Alden & Harlow, Architects.

did not show wear when traversed by sandaled feet, it is not wholly adequate for a vestibule or lobby in a New York or Chicago hotel or office building.

The tile manufacturers have long appreciated the possibilities of burnt clay for flooring. The advent of the vitreous floor tile,

which is quite recent in its appearance, was a long step in advance, as it is a material which surpasses in hardness any known natural stone. As the public demand requires, from artistic reasons as well as convenience of setting, a mosaic composed of small pieces, the tile manufacturers have brought forth the ceramic cube mosaic, which is now in the market as a strong competitor for favor with the ordinary Roman block mosaic. Marble, though looked upon by the casual observer as something extremely hard, is in fact not hard at all, rather suggesting hardness on account of its polished surface, which is unyielding to the touch. Burnt clay, with its sometimes velvety surface, does not look as hard as marble, yet the expert knows very well that marble may be scratched with soft iron, while reasonably hard burnt clay cannot be touched with a hard steel point. Again, while any floor covering which is composed of marble blocks laid upon a necessarily more or less yielding foundation is liable to develop cracks in the surface, it has been found by experience that a mosaic composed of minute fragments of burnt clay is much more rigid and less liable to develop unsightly cracks than is the marble mosaic. This is for reasons which can be readily appreciated. When the ordinary marble mosaic is set, it has to be ground and polished off on account of irregularity of the cubes, and this grinding process sometimes has a tendency to break the set of the cement, so that it is a very easy matter to dislodge individual cubes, and in case of repairs it is found that the cement does not adhere very closely to the marble. On the other hand, vitreous tiling forms a complete union with Portland cement mortar. The silica contained in the cement attacks the silica developed to a glass-like set in the vitreous tile and adheres to it in such a degree that it will be impossible to part cement mortar and tile without splitting either parts of the mortar or parts of the tile.

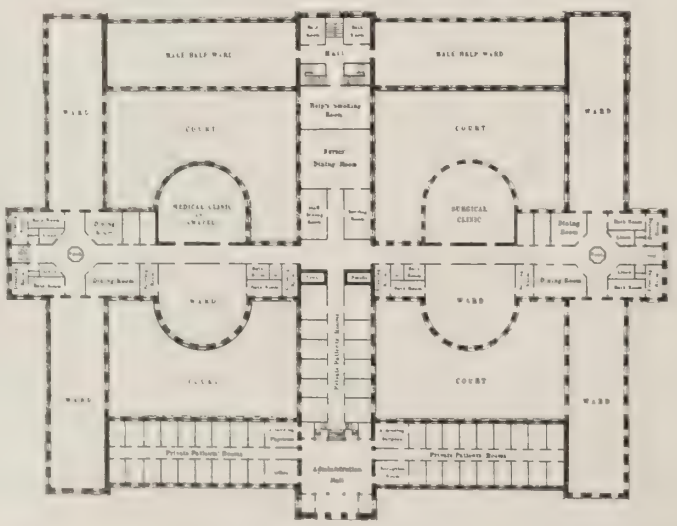
The color of marble mosaic floors is very easily obscured by wear. It can be brought back by scouring and polishing, but the surface of the vitreous tiling is so hard that the scratching due to walking over it does not deface the surface, and it is impossible to scratch or stain it. As the surface becomes polished through wear, the colors remain the same.

In an artistic sense, when marble work is just right, it is extremely satisfactory, but any one who has experimented with color attempts in marble mosaic knows how limited is the available palette. The best colored marbles are the expensive ones, and for ordinary conditions the cost is so great that they are not used at all. The choice is limited, in this market, at least, to a rather dirty green, two shades of yellow, a dull red, black and white, and the varying shades of Tennessee. On the other hand, with vitreous tile there is almost no limit to the range of the possible colors, and they are all of practically the same cost, so that the artist in using the latter material has a perfectly free hand and can work out his color scheme in the humblest building without the restrictions of prohibited colors.



(From *The Illustrated Buffalo Express.* Copyright, 1895, by Geo. E. Matthews & Co.)

BUFFALO GENERAL HOSPITAL, BUFFALO, N. Y.
George Cary, Architect.



GROUND PLAN, BUFFALO GENERAL HOSPITAL, BUFFALO, N. Y.
George Cary, Architect.

CURRENT ITEMS OF INTEREST.

THE new Mercantile Building, New York City, Robert Maynicke, architect, Thos. J. Reilly, builder, will have a front of semi-glazed brick, which are being furnished by the American Enameled Brick and Tile Company.

DECKER & ST. CLAIR, the general contractors for the new



GARDEN VASE.
Executed in terra-cotta by the Winkle Terra-Cotta Company.
Barnett, Haynes & Barnett, Architects.

church in Winsted, Conn., have let the contract for furnishing the structural ironwork in the building to the Berlin Iron Bridge Company, of East Berlin, Conn.

CHAMBERS BROTHERS COMPANY, of Philadelphia, report a decided improvement in their business during the past month. They are giving especial attention to the trade South, and are making new customers in that section.

THE BERLIN IRON BRIDGE COMPANY, East Berlin, Conn., are erecting for the Seamless Metal Company, Sing Sing, N. Y., across the railroad tracks connecting the different parts of their plant, a steel foot bridge.

THE DAGUS CLAY MANUFACTURING COMPANY are furnishing the face and molded brick for the First National Bank, at Fairmont, W. Va. These are an old gold mottled brick. They are also furnishing a light pink brick for the residence of Mr. L. B. Cushman, North East, Pa.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., are erecting for the United Gas Improvement Company, Waterbury, Conn., the steel work for a generator room and an engine room. These roofs are to have steel trusses, supporting the roof covering.

JOHN H. BLACK, Buffalo representative of the Kittanning Brick and Fire Clay Company, is furnishing the vitrified buff brick that is being used in the interior of the new addition to the Buffalo Cooperative Brewery, Esenwein & Johnson, architects; also the gray bricks being used in the Albermarle and Aberdeen apartment houses, John S. Rowe, architect.

THE CELADON TERRA-COTTA COMPANY are supplying their roofing tile for the following new buildings: Residence for J. W. Mitchell, Columbus, Ohio, Yost & Packard, architects; residence for L. Hicklem, Columbus, Ohio, E. W. Hart, architect; office for Dr. C. M. Taylor, Columbus, Ohio, W. T. Mills, architect; bathing establishment, Revere Beach, Mass., Stickney & Austin, architects.

THE ST. LOUIS TERRA-COTTA COMPANY wish announced the fact that the company has been recently reorganized, and under the present management is in a position to guarantee satisfactory work and prompt deliveries on all contracts which may be placed with them.

The entire plant has been overhauled and fully equipped with the best terra-cotta machinery, the kiln capacity increased, and an enameling department added for the manufacture of enameled and glazed terra-cotta and enameled brick. The modeling department is in charge of experienced men, thoroughly competent to execute difficult work.

The company would be glad to render estimates on any work in their line.

THE following new buildings are being or are about to be equipped with the Bolles Revolving Sash or the Queen Overhead Pulleys, or both: Bourne Office Building, ten stories, Liberty Street, New York City, Ernest Flagg, architect (Bolles Revolving Sash and Queen Overhead Pulleys); Vicent Office Building, sixteen stories,



RESIDENCE, BEACON STREET, BOSTON.
McKim, Mead & White, Architects.

Duane Street and Broadway, New York City, George B. Post, architect (Bolles Revolving Sash and Queen Overhead Pulleys); Mott Avenue Public School, New York City, C. B. J. Snyder, architect (Bolles Revolving Sash); Auduborn Avenue Public School, New York City, C. B. J. Snyder, architect (Bolles Revolving Sash); apartment house, Fifth Avenue and 45th Street, New York City, J. O'Rourke & Sons, architects (Bolles Revolving Sash and Queen Overhead Pulleys); German Liederkranz Club House, Brooklyn, N. Y. (Bolles Revolving Sash); Seelye Hall, Smith College, Northampton, Mass., York & Sawyer, architects (Bolles Revolving Sash and Queen Overhead Pulleys); New York Hospital, New York City, Cady, Berg & See, architects (Queen Overhead Pulleys); Caledonia Club, New York City, Alfred H. Taylor, architect (Bolles Revolving Sash).

One of the most annoying things in any house is a sliding door hanger that will not run smoothly; that will leave the track, stick, or otherwise behave in an unpleasant manner just when such things cause most inconvenience. Lately, what bears every evidence of being quite the ideal parlor door hanger has been placed on the market by The McCabe Hanger Manufacturing Company, manufacturers of hangers for parlor, barn, fire, elevator, and accordion doors. The hanger in question is a perfect device and a gem in the mechanical way. The track is steel, and the wheels of the carriage are turned wood fiber, thus assuring the least possible noise. The carriage has ball bearings and case-hardened cones, and is constructed along the line of a bicycle bearing. The hangers have been used in Biltmore, the Vanderbilt estate in North Carolina, the Carnegie estate in Florida, also the New York City house. They will also be used in the Vanderbilt house on Fifth Avenue, now undergoing extensive repairs and decorations. They were used throughout the new Sherry Building and the Columbia Library Building. In the elevator hangers this firm have been unusually successful, theirs having been specified on most of the large buildings that have been built all over the country in the last few years.

FOR SALE.

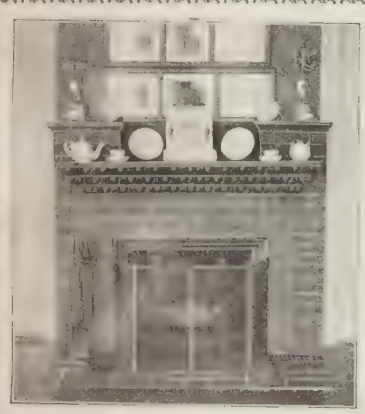
CLAY MANUFACTURING PLANT WITH STEAM POWER AND 4 MUFFLED KILNS, ETC., SITUATED IN NEW JERSEY, 20 MILES FROM NEW YORK CITY, BEST CLAY LOCALITY, SUITABLE FOR POTTERY OR TILE WORK. WILL EITHER LEASE, SELL, OR TAKE INTEREST IN BUSINESS. ADDRESS

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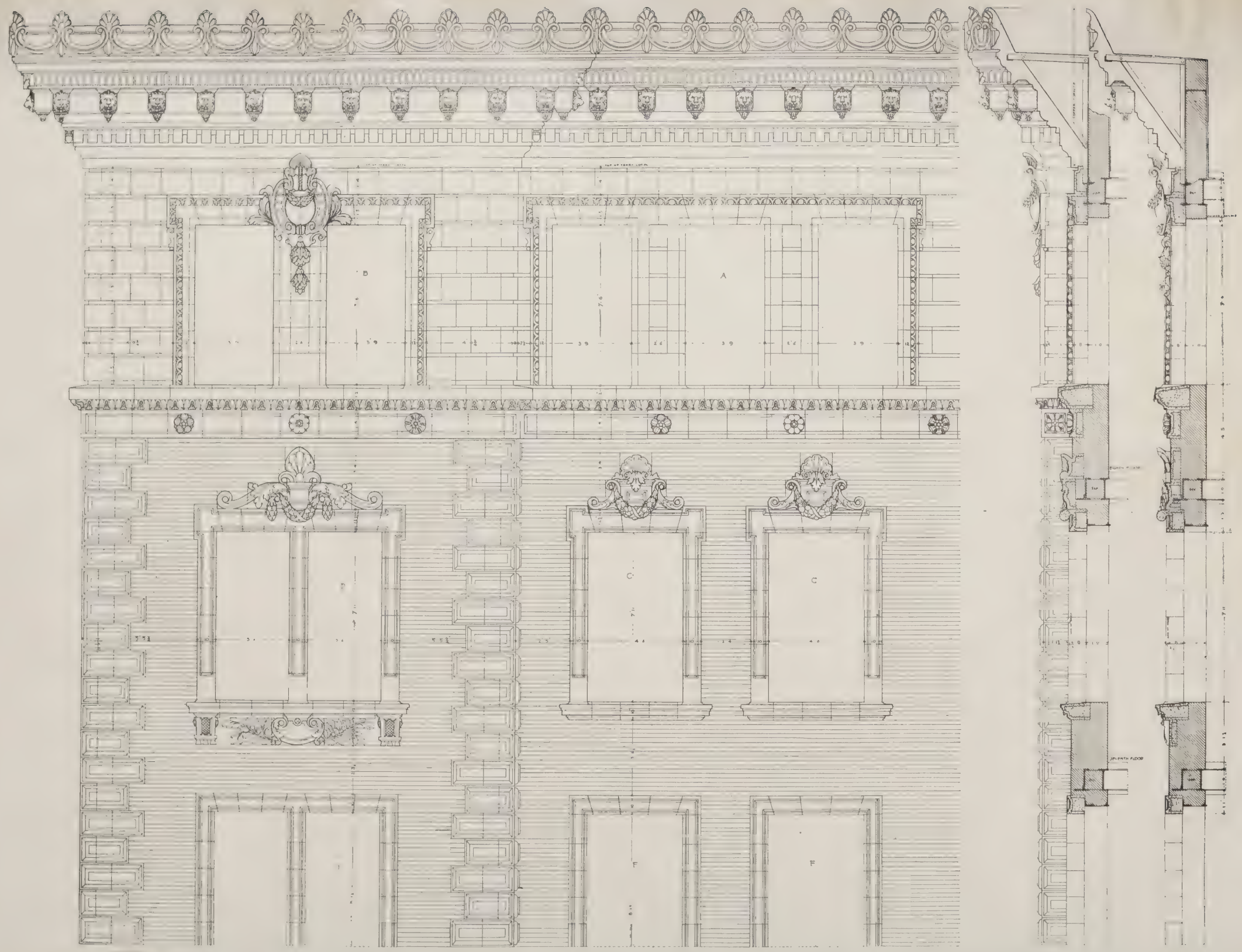

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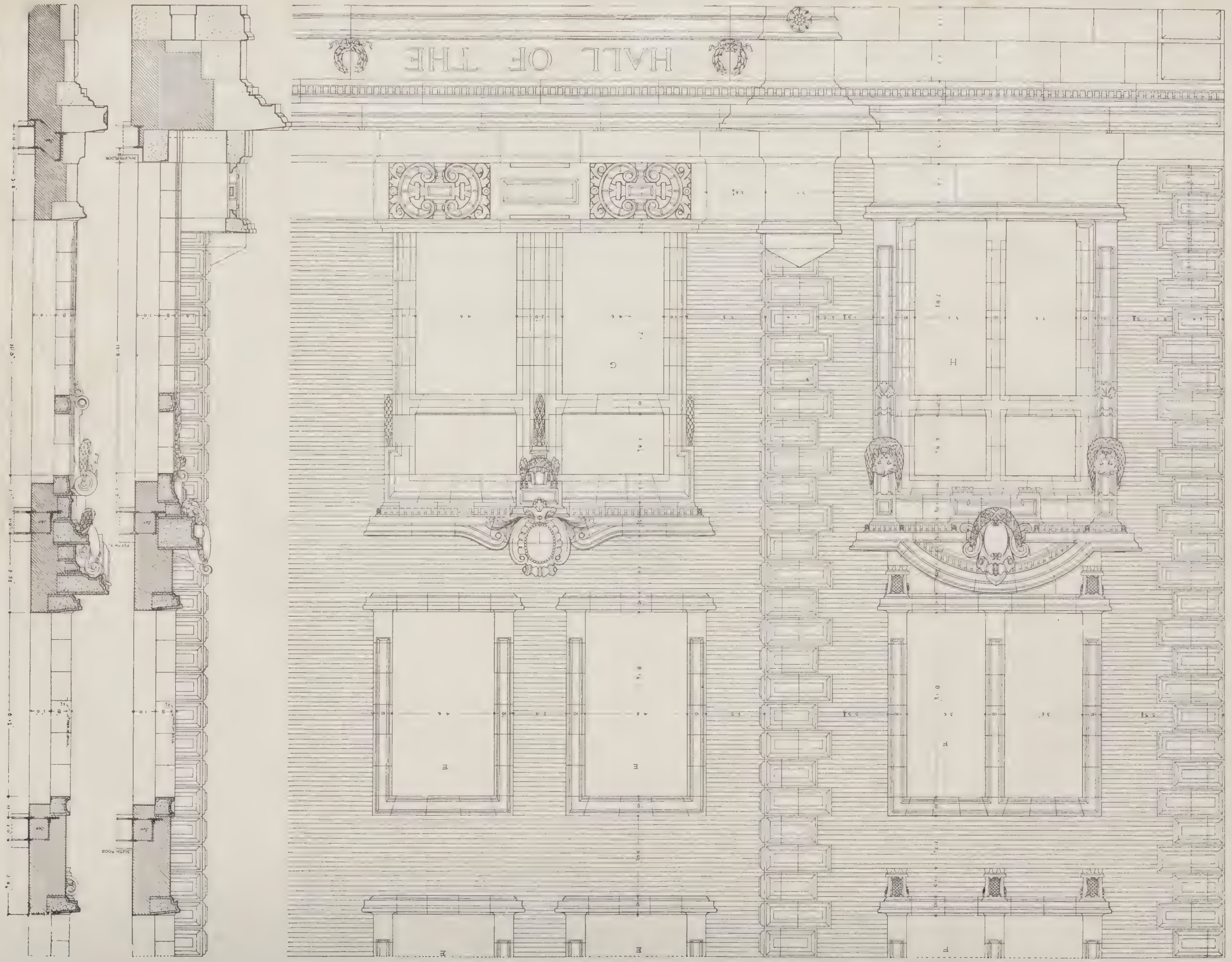




DETAIL OF CORNICE AND UPPER PORTION OF HALL OF THE BOARD OF EDUCATION, NEW YORK CITY.

N. LE BRUN & SONS. ARCHITECTS.

T. BRIDGER.



ET .IL, 3 A .D 4TH ST ES, .A. L OF THE BOARD OF EDUCA .N, NEW YORK CITY.
N. LE BRUN + S .S, L .ECTS.

VOLVME VII DEC. 1898 No. 12

THE BRICKBVILDER

OFFICE 85 WATER STREET BOSTON

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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COLORED BRICK.

THERE was a time, not very long since, when to designate anything as being brick color was equivalent to saying it was a deep, dull red, and no other tone but red was thought of in connection with burnt clay for building material. But when the newer shades of brick began to be considered, all this was changed, and our constructors very speedily found themselves in possession of a great variety of tones, ranging from almost jet black through chocolate colors, browns, reds, buffs, and grays, to the pale yellows and whites. The whole subject of colored bricks was an innovation, for a while at least, and in the natural efforts to provide the designer with all the required shades, to place any suitable color at his disposal, the multiplying of colored bricks increased perhaps beyond measure. Certainly for a while we had a surfeit of some of the lighter shades of brick, to an extent which was bound to bring about a reaction, especially as in a great many cases very little care had been exercised in selecting the particular color. We have known repeated instances where a strong-colored mottled brick looked about perfect in one locality or in one design, when the identical shade used on a different side of the street, with different surroundings, seemed harsh and totally out of place. Consequently the manufacturers of our colored bricks have sometimes had to beware of their friends, and have suffered because of injudicious selection to an extent which has been prejudicial to the use of some of the best shades. Again, the colored brick have not always been made with the most care. Some of the companies have put out products which have hurt the trade a great deal, and the cheap manufacturers of poor brick have imitated all the shades produced by better companies, so that it is not unnatural to expect a reaction in favor of red brick. We notice in one of our contemporaries statements to the effect that red brick is returning to favor and that the use of the lighter tones of brick are a passing fashion, which is likely to be superseded by the use very largely of the old-fashioned red brick, and it quotes a number of buildings in New York, which have been constructed entirely of the darker shades, arguing from this that the colored bricks are doomed. We do not at all share this belief. We have always admired red brick, and in its place it is an excellent tone, blending admirably with its surroundings and adapting itself to many different styles of design, but he would be a poor designer indeed who felt constrained to limit himself to any one tone or quality, either light or dark. The dreary monotony of continuous rows of sad, overdone bricks is to be deplored, no matter what the particular tone may be. There are a good many incipient shades now in the market which could well be spared, but there are certain shades of buff, pale red, and mottled browns which we believe will always remain in favor, and will always be used by thinking designers in producing certain effects. Again, some of the shades of gray have come to stay, and have been a factor in some of our best buildings, without suggesting in the slightest degree a forced use of either color or material; while as for white brick in its various modifications, there is every indication to believe that its use is only just beginning to be appreciated, and that in the near future it will command a much larger measure of appreciation than has heretofore been awarded it. To build a structure in strict conformity to any one type is not a course most calculated to develop good architecture. The individuality of ideas which is so prominent in our modern work has received no inconsiderable measure of its strength from the opportunities for real color which have been afforded by our brick manufacturers, and we have every reason to believe that the reaction against the excessive use of the lighter bricks is a perfectly healthy one, that the pendulum is not to swing entirely the other way, that we will be spared the affliction of a town made brick red, and that the wide palette, from which with care and forethought so much can be accomplished, will be superior to any mere whims of fashion.

A PROPOSITION has recently been suggested in this city which certainly deserves earnest thought. The Museum of Fine Arts is situated on a tract of land facing Copley Square, and open on each side. At the time it was built, some twenty years ago, the district had not received its present character, and in fact Copley Square in those days was almost in the suburbs. At present the Museum is faced on one side by buildings of an altogether non-fire-proof character; on the other it has for a near neighbor a recently constructed family hotel, of fire-proof construction, and the buildings of the Institute of Technology, constructed with the so-called slow-burning construction, which, however, did not hinder a fire in them this last summer. Immediately adjoining it towards the southwest is a large district of middle-class dwellings, which would offer slight resistance to a large fire. In the changes incidental to the railroad systems entering the city, it has been necessary to relocate the nearest fire-engine house, and the Museum now finds itself at least partially surrounded by buildings of a questionable fire-proof character and with less readily available help in case of conflagration. It

has been seriously considered whether the Museum should not be removed from its present quarters and rebuilt somewhere in the Park System, where it could be entirely isolated from adjoining structures. The New York fire emphasizes the danger from one's neighbors. A fire in the Museum would result in damages that no insurance policy could begin to make good. The neighbors of the Museum are apt to become more numerous rather than less, and though the building itself is fire-proof in construction, its large skylights and necessarily large openings would make it an easy prey to a conflagration. In view of all these conditions, we feel that the trustees of the Museum are not only justified in considering the removal to a more open location, but that such removal is a duty which they owe to the community and to the invaluable treasures placed under their care. Copley Square is now enriched by the presence of Trinity and the Public Library, the New Old South and the Museum, but it would be far better for the square to lose a portion of its distinctive character than to take any chances of damage, however slight, to the treasures which the Museum contains.

THE LEAGUE COMPETITIONS.

THE activity and continued progress manifested by our architectural societies is one of the encouraging signs of the times. The Architectural League, of New York, worthily keeps up its traditions by the manner in which it is constantly creating opportunities for study and for improvement, and placing such opportunities within the reach of the younger members of the profession. The announcement has been received of the competitions which the League is to hold this year for the awards of the gold and silver medals, the Avery prize of fifty dollars, and the President's prize of the bronze medal and twenty-five dollars. The award of the gold and silver medals and the Avery prize are open to all residents of the United States. The President's prize is open to the members of the Architectural League only. For the gold and silver medals the program contemplates a design for reviewing stands and public grand stands, arches, etc., in the nature of temporary structures required for the purpose of reviewing an army returning from foreign service. The site is assumed to be Riverside Park in the vicinity of Grant's Tomb, which in its present condition is certainly sadly in need of accessories. A reviewing stand of the description provided for in this program would be a most inspiring addition to Riverside Park, and the mere fun of studying out such a problem ought to be enough to call out a great many designs from our younger architects. For the Avery prize a design is required for a war medal for decoration of soldiers in commemoration of Santiago, while the President's prize is to be awarded for the best design for a poster for the League Exhibition of 1899. Full particulars of these competitions can be obtained by addressing Mr. Robert W. Gibson, Chairman of the Committee on Competitions, 215 West 57th Street, New York City.

OWING to Mr. Wheelwright's absence in Europe, paper No. XIV. of the American Schoolhouse Series will not be published until the January issue. There will be at least two more papers in this series, which will be published in consecutive issues following January.



WINDOW JAMB AND CONSOL.
Executed in Terra-Cotta by the New York Architectural Terra-Cotta Company.

PERSONAL, CLUB, AND SUNDRY NEWS ITEMS.

MESSRS. INGLE AND ALMIRALL, architects, announce the removal of their offices, after December 11, from 874 Broadway to 10 and 12 E. 23d Street, New York.

THE MEXICAN CONSTRUCTION AND ENGINEERING COMPANY, City of Mexico, would be glad to receive catalogues and samples of American building materials.

HERBERT E. GATES, architect, 58 Bedford Row, Halifax, Nova Scotia, would be glad to receive catalogues and samples of American building materials.

THE BUILDERS AND TRADERS EXCHANGE, of Columbus, Ohio, request manufacturers' and dealers' catalogues.

ON Monday evening, November 21, Normand S. Patton addressed the members of the Chicago Architectural Club on the subject of "A Typical Public School," especial reference being given to the needs of Chicago schools.

THE annual meeting and dinner of the Beaux Arts Society was held at the Café Flouret, on November 18.

The retiring president, Mr. Walter Cook, addressed the society, speaking of the work of the past year, and in particular of the success of members of the society in the New York Library and California University competitions.

The reports of the secretary, treasurer, and committee on education were accepted, that of the treasurer especially being received with great enthusiasm.

The following officers were elected for the coming year: President, John Galen Howard; Vice-President, Edward L. Tilton; Treasurer, Joseph H. McGuire; Secretary, Charles Butler; Corresponding Secretary, Theo. Evernghim Blake; Members of the Committee on Education, Ernest Flagg, John M. Carrere, and Charles Morris. Cary S. Rodman, Atelier Blondel, Scellier de Gisors, was elected a member of the society.

An invitation was received from the Architectural League to take part in their dinner and meeting of January 3, and it was decided to inform all the members of the society in order that as many as possible might be present.

The meeting concluded with the enthusiastic reception of the six *derniers nouveaux*.

ILLUSTRATED ADVERTISEMENTS.

THE following new illustrations may be found in the advertising pages of this number: detail of window, Plymouth Building, Minneapolis, Frederick Kees, architect; advertisement of Fiske, Homes & Co., page x; residence at Buffalo, N. Y., C. D. Swan, architect; advertisement of The Harbison & Walker Company, page xv; the Crozer Building, Philadelphia, Frank Miles Day & Bro., architects; advertisement of Conkling, Armstrong Terra-Cotta Company, page v; Somerset Apartment Hotel, Boston, Arthur H. Bowditch, architect; advertisement of The Celadon Terra-Cotta Company, Limited, page xxvii.

Suburban Residence Built of Brick.

COST, TEN THOUSAND DOLLARS.

BY WALTER COPE.

HOUSES are built to live in and not to look on; therefore, let use be preferred to uniformity, except where both may be had," is a dictum oftener quoted than followed. Whose fault is this? Are we architects responsible? Is it our fault or our misfortune that much of the domestic architecture of the present day fails to express anything very clearly and continually wanders from one



caprice of style to another, until we become well-nigh desperate at this eternal torment of style and detail, this babel of tongues?

The owner usually selects a site for his house before he consults with us, and so begins to crystallize his ideas too soon, seizing often upon what he considers his own particular province, the "practical" part of the problem, and limiting us to what he believes to be the architect's only sphere, the mere embellishing of his scheme. True, he magnanimously credits us with the magical power to make impossible proportions beautiful, and in a general way to bring order out of chaos. So, where he sticks fast, he says: "You as an architect can, of course, work that out. I don't so much care how that part goes, but I must have," etc. Our faces glow with well-feigned admiration, while our hearts sink. He leaves us, having secured the promise of a sketch in the course of a few days. We put on our hats, go out to lunch, come back and throw ourselves defiantly at the problem as we have accepted it, with a conviction that the scheme is hopelessly defective, but must somehow or other be beautified into shape. Is it any wonder, under such conditions, that we allow our whole energy and enthusiasm to be taken up with that part in which "the stranger intermeddleth not"?



But if the result of our efforts is a senseless and wasteful plan whose defects are but partly masked behind a studied arrangement of architectural detail, whose is the fault? It is ours, because we do not try to capture the citadel of the Philistine but content ourselves instead with sallying now and again from our own stronghold, first in one direction and then in another, slashing madly to right and left, to prove to the world that we are the rightful masters. Yes! We are to blame. We are cowards. The Philistines are not so strong as we imagine and can be won by strategy if not by direct attack, and when they are captured and put under tribute they will make very good subjects, and the architectural millennium will then begin.

In the case before us, THE BRICKBUILDER furnishes the lot and the owner keeps entirely in the background. The lot is uncomfortably narrow and slopes quite too violently to make the planning of a house for it a restful or soothing exercise. Besides, it slopes south and west instead of south and east, and this forces me to put my porch on the west side, in the glare of the afternoon sun, since it must not be on the front, and we shall have to wait until the oak trees grow big before it will be right. Sadder still, our garden will not get the early morning sun. Failing to exchange the lot for one I liked better, I would have set the house close to the western side instead of the eastern, with its drawing room, library and dining room all looking out on the porch and garden to the east, but I could not bring my mind to thus give up the distant view over the valley and out into the western sky. Walled gardens are lovely — outdoor rooms, with the sky for a ceiling, and the rest of the world hidden. But I must have this and the distant view, too — both of them — for my library windows.

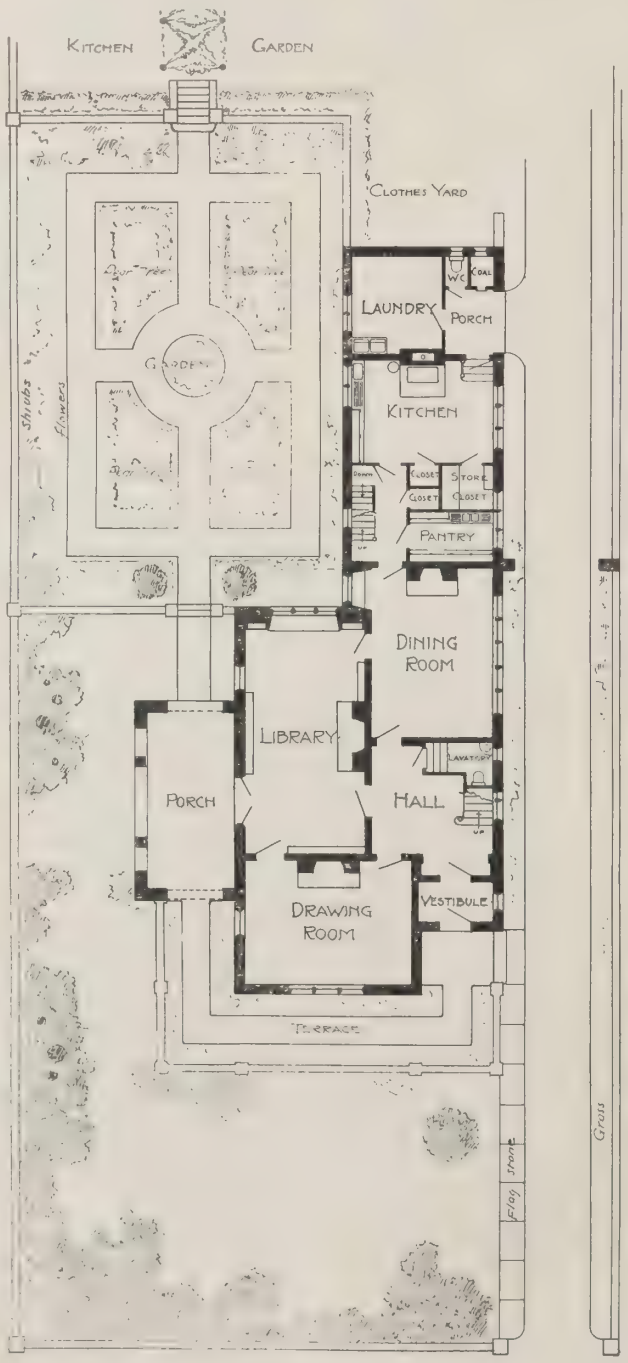
So the house is made as narrow as possible and placed close to the eastern line with a narrow driveway between it and our neighbor up the hill, whom we cut off with a brick wall of goodly height. Ivy will grow well on this wall, for it is mostly against the bank and therefore damp and cool in hot weather. I don't own a horse or carriage, but hope to some day, and in the meanwhile the driveway shall be for the tradesmen and for ourselves when we hire a cab to take us out or to bring us from the station in the rain. When I can afford it I may build a little stable, up at the back of the lot. In plan the house is, in a sense, tumbled together, with "use preferred to uniformity." The entrance is at the southeast corner with the doorway facing the front, though the hall lies on the eastern side of the house. The dining room, of course, is on the east side, too, for every one should start the day with some sunshine at breakfast. And we will have a little peep, too, at the sunset and a breath of sweet air from the garden through the little window in the west corner. The lot is too narrow to waste in a passage from the kitchen to the front door. This never seemed to me a matter of importance because the waitress answers the door bell. A drawing room, I suppose, has to be; first because THE BRICKBUILDER says so, and secondly because in the course of the year many people call to see us who must be received decently, though we have no idea of sharing our library with them. Besides, we may need a drawing room for our daughter's wedding twenty years hence; so we are to have one, and we shall try not to make it altogether a Potter's Field. But I feel it in my bones that we are going to live in the library and that the door between the two will

be surely kept locked, except when we have a party. As for the library, I like a long room if the ceiling is not too high. A number of people can be sociable in such a room in a reasonable and a happy way, because they will not sit in a circle like an Indian council. As to a porch, I cannot abide it on the front, for we want it to ourselves, whether our visitors be peddlers or our dearest friends. Our friends are sure of a welcome, and if they hear our voices on the porch can find us by walking around the terrace without stopping to ring the front-door bell.

The house will have its kitchen wing, for in this climate any arrangement which does not insure air on both sides of the kitchen and pantries, however small they may be, is a mistake. The pantry will not open direct into the dining room, for it is trying for the hostess to keep up the conversation with her guests while she hears her glass and china being smashed at the sink. There is a closet for the brooms and coal-scuttles, and a way for me to get to the cellar without intruding on the cook and her friends; and though the back stairs are bound to carry the smells of the cooking to the second story, we hope to successfully head them off there from the front of the house. The kitchen will have a large ventilator in the ceiling — not in the wall near the ceiling — opening into the flue which encloses the iron smoke pipe of the range, and the tops of the kitchen windows on both sides will be on a level with the ceiling, so that we hope to ventilate the kitchen well and to keep the room over it reasonably cool in summer. There is a closet for the cook, a weak concession to the modern false sense of order; cooks should not be allowed to have closets where they can associate old bonnets and ill-washed pots. The little storeroom is just big enough for a refrigerator and a few shelves but it has its own window to keep it cool. This room we want to line completely with glazed tiles. The cook will not have to drag her coal up from the cellar, for there is a bin on the kitchen porch which will hold a supply of coal for three or four months.



The laundry is entered only from the outside and is ventilated like the kitchen into the large flue. The clothes yard will be back beside the kitchen garden.



Upstairs we have tried for quiet rooms, cut off as much as possible from the sounds in the hall below; and the second floor will be built with two sets of joists, quite independent of each other: one to carry the first story ceiling and the other for the second floor, with loose deadening felt between them. This method of deadening floors I have found very effective. Several of the closets between the rooms have doors on each side, so that they may be used for either room, as may prove most convenient, or as communicating passages when desired.

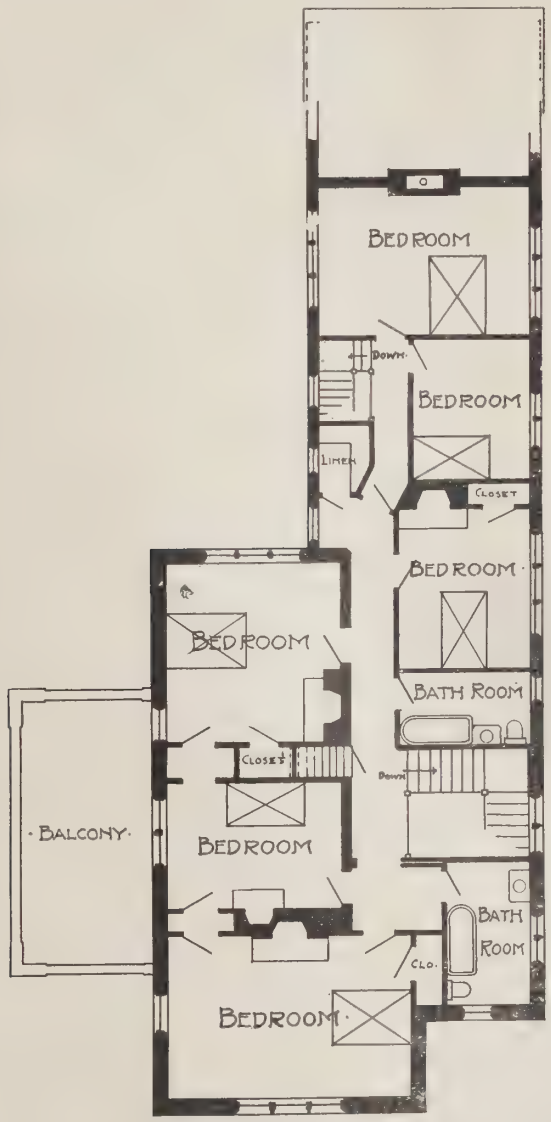
The loft will be reached by a little steep stair and will have nothing but a floor, and while it is not intended for anything but trunks and lumber, I know that it will make the most fascinating of play-rooms for the children on a rainy day, — a fairy world which the "grown-ups" never invade, — full of delightful mysteries, the scene of dark conspiracies, of feasts and tournaments and hair-breadth escapes, of solemn funerals and happy weddings.

But the house is only half of our scheme. It will be as simple and cheap as we can build it substantially. The bricks will be dark red hard brick, selected merely for color and laid Flemish bond with over-burnt headers, the joints about $\frac{5}{16}$ in. wide and raked out deep. What little there is of moulding or coping will be of hand-made bricks like the others, except at the entrance door where we shall waste a little money on a bit of detail in dark red stone. On the street front and on both sides of the lot, running back at least as far as the kitchen garden, we shall have a brick wall coped with bricks on edge.

And on this we shall plant vines — Irish ivy, where it will grow well — and in places jessamine, and climbing roses, and honeysuckle, and virgin's bower. Then there will be some beeches and dogwood, and a lot of

rhododendrons down near the street, and two or three oak trees, and close up near the terrace, a yew. Back near the garden will be more oak trees and a honey locust and a lot of sassafras, and at the garden entrance, two box trees. At the back of the garden, on each side of the steps, there will be lilacs, and along the west side, hawthorn and flowering plums and what-not. The garden will have four pear trees, one in each main bed, as in all good old-fashioned gardens. Our summer sun is too hot, and the feathery shade of the pear trees is welcome to the flowers. Besides, what is more beautiful than a pear tree in bloom?

This is not half of what we shall plant; but why mention each tree or shrub more than the books we intend to have in our library or the pictures on our walls? We have got an old Scotch gardener, and though he does not think much of my garden lay-out and shakes his head ominously at it, I know it is only because he intends



to surprise us next summer with the wonderful results that skill can accomplish under adverse conditions. He declares that the side next the house is hopeless, but I notice that he is devoting much attention to it, and that the florists' and nurserymen's bills are like to ruin me. He has not been in Spain and does not know that ivy-leaf geraniums should be set in pots on a parapet, to tumble over the wall in masses of bloom. But we shall see: he loves flowers, and I cannot help thinking that he takes a pitying interest in me as one who really cares for them too, though full of strange notions about twigs and masses of foliage, and hopelessly ignorant of botany. The kitchen garden shall be his, and if I will not allow coleus in a bed in the front grass, or the garden given over entirely to prize specimens for the flower show, he can do what he likes in his own undisputed domain.

The Architecture of Apartment Buildings. III.

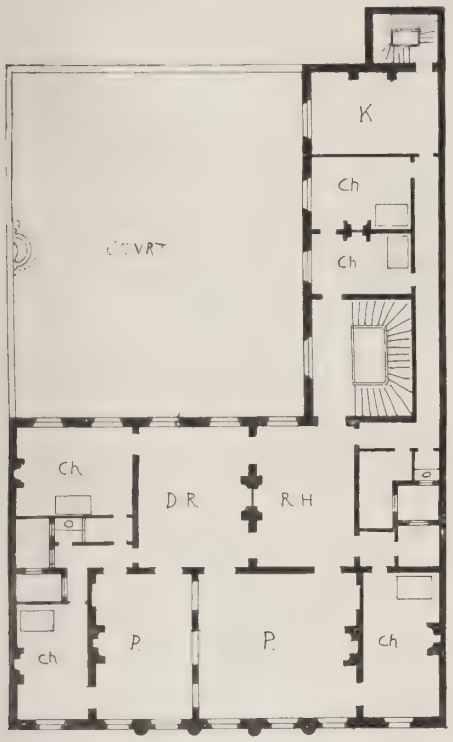
BY IRVING K. POND.

IN the matter of height, to the extreme of which modern buildings of all classes seem to aspire, much of interest is brought to the problem of the apartment building. To what number shall stories be added one upon another? Beyond what height do stairs begin to be a burden to owner and occupant? and what is the lowest limit at which the elevator appears as an income-producing factor? These and kindred questions arise when the matter of height presents itself. An absolutely satisfactory answer to these questions implies a knowledge of all the conditions surrounding the special problem; but a few general lines may be laid down. There are various classes of apartment buildings, and even the term "first class" is relative and varies with the country, the province, or indeed the city. But taking it to mean the highest type yet produced in Paris, for instance, a city of apartments, or in the two or three principal American cities, it is safe to say of the "apartment of the first class," that in these latter cities the elevator can be omitted from no building of above two stories in height, and this brings the investor up against the generally accepted statement, that in no building under five stories in height, and with two apartments served to each story, is the elevator a profitable institution. But profitable or not to the owner, in many localities the elevator is considered an absolute necessity by tenants, and must be operated. Of course, in apartments of the highest type it is desirable so to plan the building that but one apartment is served to each story, yet this makes the matter of the elevator of great moment to the investor, from the points both of original outlay and of the expense of continued operation, and three or four-storied apartment buildings must be extremely well planned and very desirably located to produce above what is expected of an investment, sufficient to cover the interest on the first cost of the plant and maintain the every-day operation of the elevator; so that, as the elevator is a necessary feature in the arrangement of any well-equipped apartment building, it remains to make it not an evil to be endured by the owner alone, but a blessing which will fall with equal beneficence on owner and occupant. Experience has demonstrated that this good effect may be brought about by increasing to the natural limit the number of stories of the building; the natural limit being that imposed by local conditions, the width of contiguous streets or alleys, the size of the building lot, the character of the locality, and so on. There is no limit to the height of even a first-class apartment building, except as determined by these and reasons of structural economy and necessity, for the upper stories are the more to be desired, as they are above the dust, noise, and discomfort of the city pavements, and, where prospects are to be had, command wider views.

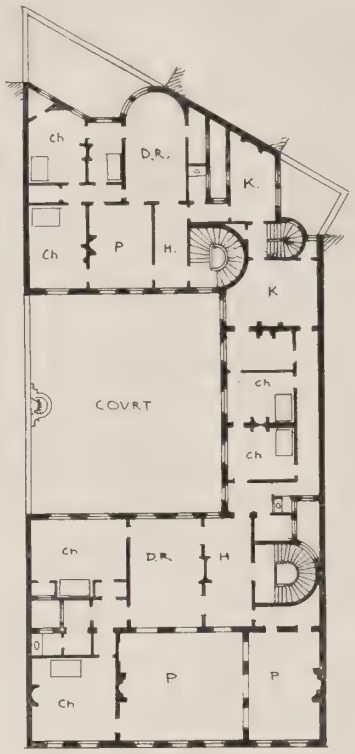
The elevator has made possible the high building, which itself was the outgrowth of a demand for the concentration of masses of humanity in desirable or seemingly desirable localities, for business or the purposes of residence. The high building has brought in its train many important problems for solution, and among them is the problem of the court. The court which is capable of such liberal and artistic treatment is now apt to be studied only from the standpoints of the necessity for light (and not too much of that) and for air. The unsightliness and ofttimes unwholesomeness of the back alleys, which are a feature in the geography of American cities, have operated against the use of the rear of the lot to the best advantage, and the street front is about all there is architecturally to an American apartment, or, for that matter, business building. In Paris, as there are no back alleys, each lot and almost each building abuts directly upon its neighbor in the rear. This has led to a systematic development of the court, which is made spacious, and is enclosed by walls on the unbuilt sides, and on one or more sides by the building, with apartments in front, or fore and aft, or on all sides, and in each case the principal stairway is reached from the court, and not directly from the street, insuring privacy, as every visitor to the building or

court must pass the *conciergerie*. In all cases the courts receive architectural treatment; in some cases they are embellished with landscape auxiliaries, and in many cases they are made useful beyond what is apparent on the mere surface; the area underneath the pavement being devoted to the use of cellars, storerooms, and not infrequently horse stalls, thus demonstrating how the French architect economizes the last scrap of space in his building, even as the French cook gives the shreds of last week's turkey or potato paring in to-day's croquette or soup. But the fact, interesting in this connection, is that the court is frequently architecturally the most pleasing portion of the building and forms the most inviting prospect from living rooms and principal chambers. Fig. 21 presents a Parisian type, with one apartment to the story, while Fig. 22 shows the French architect's manner of making desirable the rear apartment in a scheme of apartments fore and aft.

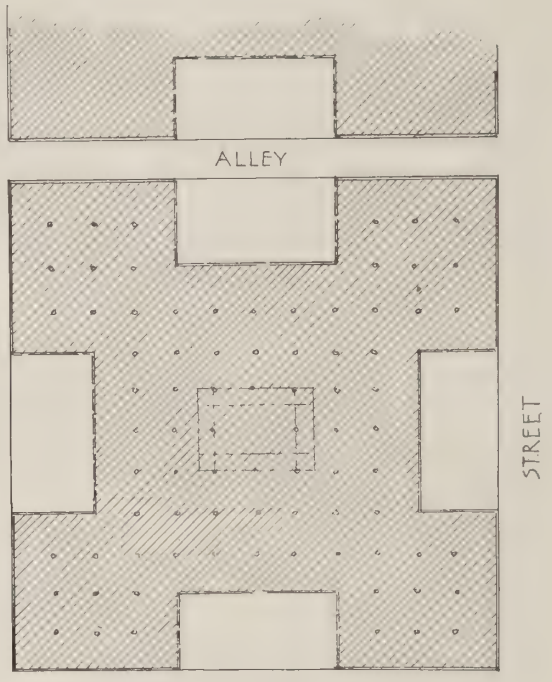
In any proposed scheme for an apartment building in which a court is necessary to the plan (and few apartment buildings are so circumstanced that courts are needless or are merely incidental), in the matter of the arrangement of rooms in any one apartment, and of the relation of apartments to each other, the ground area of the court must be studied in conjunction with and made dependent on the number and height of the stories. For it goes without saying that a court or area which would be sufficiently light and airy for a building of one or two low stories, would be entirely inadequate to its purposes in a structure in which the stories are piled up to the number of six or ten or twenty, growing more and more inadequate as the number increases; so that which a superficial glance at a ground plan may seem to reveal as wasted space in the court, in the ultimate analysis of the case may transpire to be of highest economy, commercial and otherwise; and conversely, many a building has failed as an investment, because while the plan seemed to present an economical arrangement in the finished building, the court was totally inadequate to its purposes. There can be no hard and fast rules regulating the ratio which shall exist between the height of surrounding walls and the ground area of a court, for the special situation and the nature of the chambers depending on the court all count as determining factors. To get air and sunlight into the lower stories of a group of high buildings situated on not over-wide streets is a serious problem, and the high building surrounding a court presents the same difficulties. Attempt has been made by designers of high skill, along the lines suggested in Fig. 23, plan, and Fig. 24, section, and applied in more or less modified form to office building construction with practical results. In such a scheme the streets and alleys receive the benefit of direct sunlight, which is in itself an admirable and much to be desired attainment. The same scheme as applied to an enclosed court is noted in Fig. 25. In the arrangement of stairs and elevators the scheme of Fig. 24 permits of the centralization which is required in a building designed for



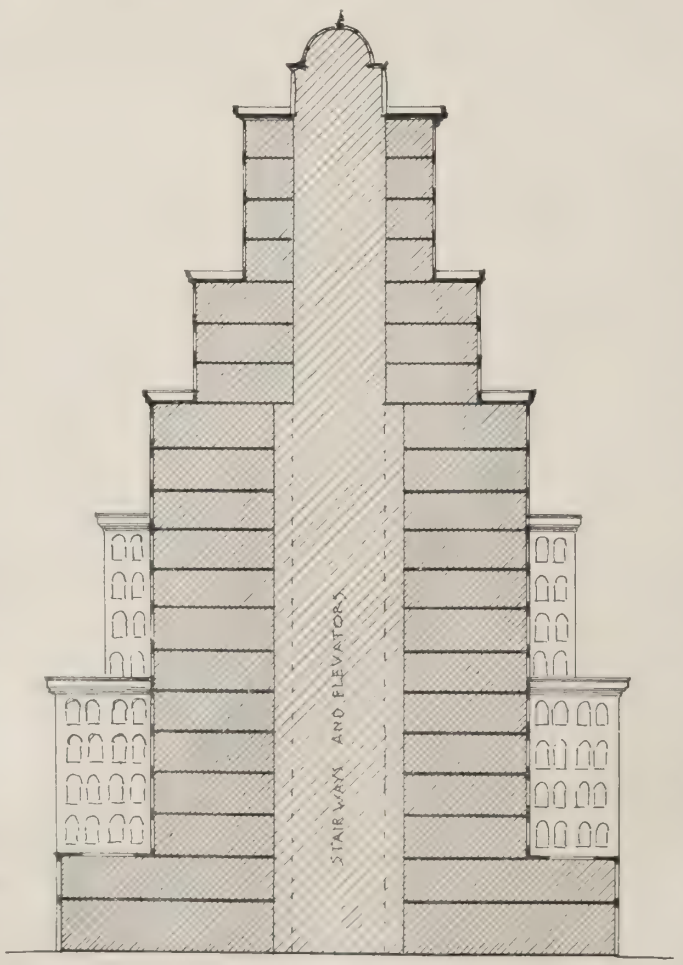
FIGVRE 21



FIGVRE 22



FIGVRE 23



FIGVRE 24

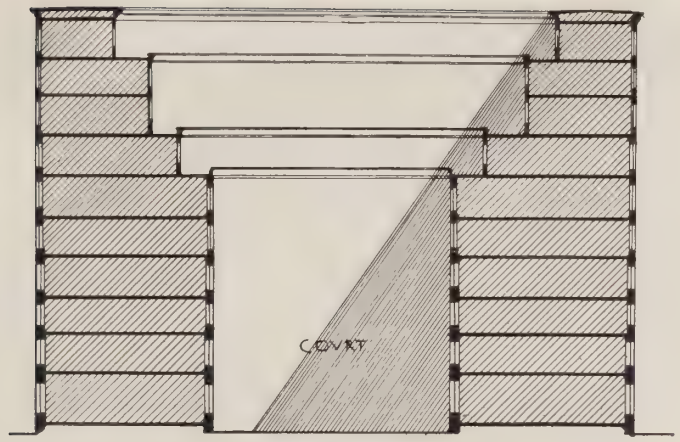


FIGURE 25

office uses, while a plan such as would result in the section indicated in Fig. 25 would admit of and require widely separated stairway and elevator arrangement, such as is demanded in large buildings with numerous apartments to the story.

This scheme of offset walls is more practical in an office than in an apartment building, where for sake of economy in plan and internal arrangements one story must repeat in a measure the principal features of the one below. However, a modification is presented in Fig. 26 in plan, and in Fig. 27 in section, which is interesting and may be found to contain much of suggestion. The mansards of Paris and the storied roofs of Nuremberg, adding their suggestiveness to a knowledge of the varied conditions of social life of a Berliner apartment building and of the communal life of a family hotel in Europe or America, but more especially in America, are reflected in the scheme, and present an arrangement designed to meet the requirements of two special and distinct phases of apartment life not heretofore mentioned. For Figs. 26 and 27 are introduced not alone to indicate how the introduction of sunlight may be effected, but also to suggest the possibility of catering to that variety which is essential to the comfort and convenience of the higher social life of to-day. A study of apartment buildings would not be complete if it did not recognize the necessities of those who are painfully self-conscious in the public glare of the hotel and desire the privacy of family life, yet wish also to avoid the cares and responsibilities coincident with the direction of a large corps of servants, and therefore wish to reduce the culinary department to a minimum. Apartments for such as these, in all their appointments, follow types already described, except as to kitchen, which is small, but so efficiently equipped that the household shall not at all times and under all conditions be dependent on the public restaurant. In a building containing apartments of this type a public restaurant must be maintained, and a general laundry is desirable.

Nor would a study of apartment buildings have fulfilled its purpose if it were to take no notice of the requirements of a large and rapidly growing constituency known as "bachelors," and of another smaller though important section known in fiction as "bachelor maids." Entire buildings are devoted to the accommodation of these members of the bodies politic and social, and these buildings generally are equipped with a restaurant more or less public in its nature. It seems highly desirable to combine bachelor apartments in the scheme with apartments for those who desire to depend for the most part on the public dining service. Such combination does

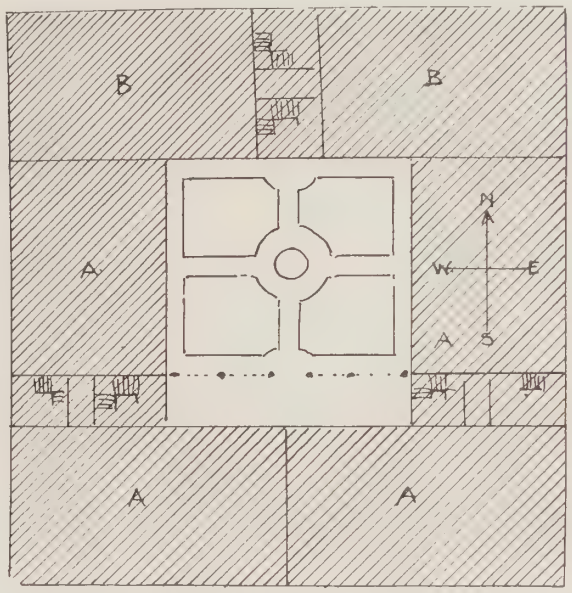


FIGURE 26

not tend to isolate the bachelor, but to bring him in closer contact with society and make him more of a factor in the life of civilization. The smallest suite for a bachelor should consist of a sitting room and bed alcove or a connected bedroom and a toilet room with basin, bath, and closet. A practicable fireplace in the sitting room is almost as much of a necessity as the room itself for the companionship and the air of comfortable homelikeness it affords.

Probably the best location for the dining room or café connected with an apartment building is in the topmost story, and so situated as to command the best views without, for while it is desirable to have the attention centered about the board, in a public dining room this is almost impossible, and attractive exterior vistas, together with pleasing interior decorations, serve to occupy thoughts and speech to the exclusion of neighbors. Smaller rooms for private service will be found desirable in connection with the apartment café. The roof café, decorated with potted plants along the lines of the palm garden, is gaining favor and will become a feature of public dining service. In all cases enclosed corridors and elevators must connect the general or public dining room with each and every apartment depending on it. The kitchen of the public café must be isolated and thoroughly ventilated, for kitchen odors are obnoxious in apartments and persist if once introduced.

A possibility of combining these various elements of public and private service and of lesser and more extended accommodation is sought to be suggested in the section presented in Fig. 27.

Another glance at this same figure with special reference to the shadow line will help to an appreciation of some of the problems of court embellishment. The ground of the court

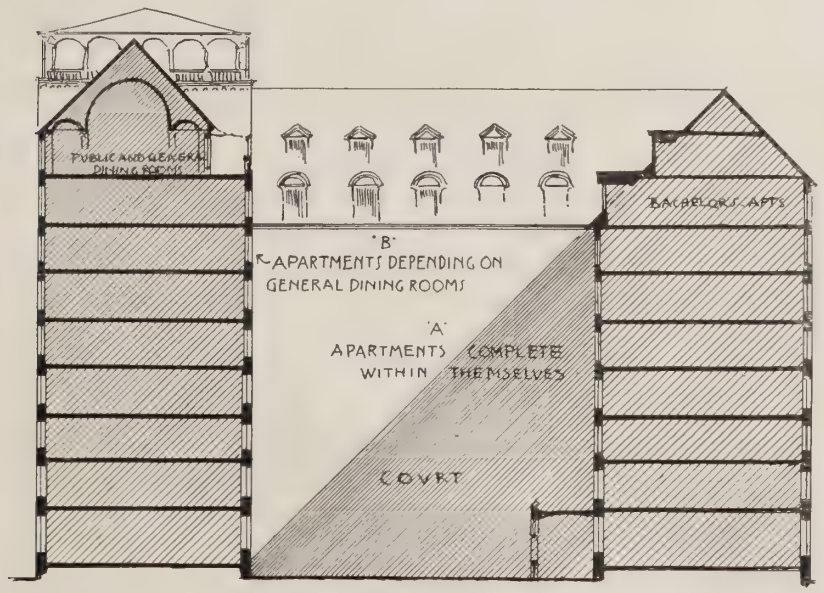


FIGURE 27

may be treated in one of three manners or in a combination of these. First, the court may be paved with a desirable material, such as marble, brick, or concrete, or these used in combination, and made to be effective viewed from above by the pattern and form and color of the integral parts, or it may be treated as an artificial garden, or again as a natural garden. A court pave which is continually drenched in shadow must be treated as a pave alone. If at some time during the day sunlight touches it, the pave may be embellished in an entirely artificial manner with plants in pots and shrubs and trees in boxes. That this treatment may be charming to a high degree is evidenced in the courts of Old-World hotels, and in the palm gardens of American cities.

A court, however, to be treated as a natural garden, that is, a garden in which is greensward and flowering plants and shrubs in beds, must be bathed in sunshine during a greater portion of the day. Natural gardens, to be entirely harmonious and artistically effective, must be laid out and developed in a formal manner when they come in close conjunction with apartment buildings, for the apartment building is necessarily one which should present a graciously formal front to the world. Courts, to be of sufficient size to admit of this treatment, may not be possible in the older and more completely occupied portions of the great cities, but struggle should be made to procure them in the newer and as yet undeveloped quarters, where the architect and landscapist may have free sway. The ideal scheme to be sought even in the neighborhood of great parks is to have convenient and homelike apartments in buildings of reasonable height, surrounding a cultivated court or garden on which the apartments shall face, gaining thus quiet and privacy and insuring a beautiful prospect, which shall continue undisturbed by neighboring building operations.

If any one accessory of court embellishment is to be given special mention, it must be the fountain, which beyond all else is the most musical, poetical, and vivifying feature of landscape treatment. Whether the court be artificial or natural in its handling or whether it be barren of all other decorative objects, the fountain gives an atmosphere of life and animation. However, it is not the function of this article to enlarge on the possibilities of court treatment beyond that already suggested, which is, in fine, that the ample court has a commercial value and may have an artistic value as well, and should be developed to the full extent of its architectural and decorative capabilities.

As it has been the purpose of these articles to bring to notice such matters of general scheme and detail as appertain particularly to apartment buildings, such other matters as all buildings have in common, as systems of plumbing or of heating or of construction of walls, and floor systems, have been disregarded ; nor is it needful to discuss them here, for they are part of the general knowledge of building, requiring, however, considerable care and foresight, not to say insight in the application. And, too, as to the architectural style which shall be adopted for the treatment of apartment buildings, little need be said. Greatly to be desired is a dignified yet domestic feeling, quietly handled in any style which is real style and which may prevail at the time and in the locality. When ideals of domesticity and home life change, style will change and no amount of argumentation will alter the course. The only suggestion that a lover of sincere style can offer is that at all times a simple scheme be made the base of the design both in plan and elevation, and to this as much of elaboration and beautiful decoration be applied as may be deemed desirable, but that no complexity of scheme be offered as a reason for its adoption. In apartments as in life complexity of purpose palls ; simplicity gains with age and knowledge.

THE principle which artists now have mainly to contend for is that of *truth;* forgotten, trodden under foot, despised if not hated for ages, this must be their watchword. If they be architects, let them remember how vitally necessary truthfulness in construction, in design, and in decoration is to any permanent success in even the smallest of their works. — *Street.*

Important Problems in Construction.

FOUNDATIONS.

BY WILLIAM W. CREHORE, ASSOC. M. AM. SOC. C. E.

THE less plastic or spongy the soil is, the more weight it will carry per unit of surface. Sometimes the ground has to be excavated to a considerable depth before a sufficiently stable soil can be found. In designing for heavy loads it is always best to investigate beforehand by sinking test holes or by making careful borings, because without the knowledge thus obtained it is impossible to decide upon the most economical method of procedure or to design a foundation that shall be best adapted to the conditions of the case. In making borings it is not sufficient to have ascertained the depth of the hard-pan below the surface, but samples of the soil taken at frequent intervals — every two or three feet if the material is changeable — should be preserved for reference. Nor unless they all yield exactly the same result is it sufficient to make two or three such examinations do for the whole building ; but a separate investigation should be made for each footing in order to determine with any degree of precision the best method of executing the work. Furthermore, it is important to continue the borings far enough to find out the thickness of the hard-pan upon which it is proposed to rest; for if it should prove to be only a crust 3 or 4 ft. thick overlying quicksand or other dangerous material, it would be unwise to impose upon it as great a load as if it were 10 or 12 ft. thick.

When upon investigation it is found necessary to go several feet below the proposed cellar floor level in order to obtain a suitable bearing stratum, it will be cheaper and better to design the footings as isolated piers, each of such section as would be determined by the distribution of its load on the bearing stratum (gravel, hard-pan, rock, or whatever it may be) with the proper allowance per unit of area. These piers can be placed well within the limits of the property and the imposed loads brought to them if necessary by means of a system of girders (see Fig. 1); or, being on the property line, may receive the wall load through a system of brick arches (see Fig. 2). If rock is found at a reasonable depth, a more satisfactory result will be obtained by sinking all piers to rock even though a good hard, bearing stratum be found a few feet above it. One reason for this is that a very much larger load per unit of area may be imposed on the rock than on the hard-pan or gravel, and thus the extra expense required to cover the greater area is avoided, and the pier may be built of uniform section from the bottom up. The piers may be built of brick, masonry, or good Portland cement concrete. In excavating for them it is necessary to drive sheet piling in the form of a square or rectangular box, or else to sink a steel cylinder or bottomless box, called a "caisson," the necessity for the latter method depending upon the depth of the hard-pan and the character of the material to be excavated. In this box, when driven or sunk, the pier is built. Good Portland cement concrete is the best and cheapest material to use for the pier, as it may be lowered in place with the least expenditure of time and labor. As caissons have to be driven vertically, each must necessarily have a cross section equal to the required bearing area of the pier. Therefore, if the bearing is to be on rock the size of the pier, the amount of the excavation and the labor required to sink the caisson are all much less than would be required if the bearing stratum were anything except rock.

As just stated, it depends on the depth and the character of the material to be excavated whether to drive sheet piling or to use steel caissons. It also depends on the amount of water in the ground. Alluvial soils or quicksand filled with water cannot be excavated below the water level without danger of drawing into the hole some of the material outside of it, and thus undermining the neighboring ground. Even with the best of tongued and grooved sheet piling quicksand will flow through the cracks and eventually cause a "cave-in" when the excavation has proceeded but a few feet. Through such material it is necessary to excavate by means of a steel caisson tightly riveted and jointed. The cutting edge must

be kept well down below the level of the excavation to prevent any back-flow of the material. It will require heavy weighting with pig iron or old rails to accomplish this, and the bulk of this weight should be piled on shelves inside the caisson as near the cutting edge as possible, without interfering with the men in their work. This will keep the center of gravity low, and thus assist in preventing the caisson from getting out of plumb as it goes down.

With a large amount of water in the ground the work of pumping increases very rapidly as the excavation goes deeper, for the water has to be kept out so that the men can work. When the caisson reaches bottom or the highest point of rock and cannot be driven down any further, the excavation is continued by driving narrow tongued and grooved yellow pine sheeting all around the inside edge (see Fig. 3). This sheeting, or "lagging," as it is called, accommodates itself to the unevenness of the rock, and when down tight all around, the rock can be thoroughly cleansed before the first concrete is thrown in. If the rock lies on a slope too great for a secure bearing and contains no unevenness in its surface into which concrete may settle and form prongs for anchoring the bottom of the pier, it may be necessary to drill a few holes and set iron anchors into the rock, allowing them to stand up an equal distance in the pier, or to dress off the rock in a series of level steps. If the pier is to rest on hard-pan or gravel instead of rock, no lagging is needed. The cutting edge of the caisson should be sunk well into the hard stratum and the bottom of the hole leveled off ready for the concrete. In holes where the water runs in rapidly it is necessary to work fast towards the end. Concrete should be mixed dry in large quantities, and as soon as the bottom of the hole is prepared, the pumps should be withdrawn and the concrete lowered in as quickly as possible, so as to keep ahead of the water, which will at once begin to accumulate.

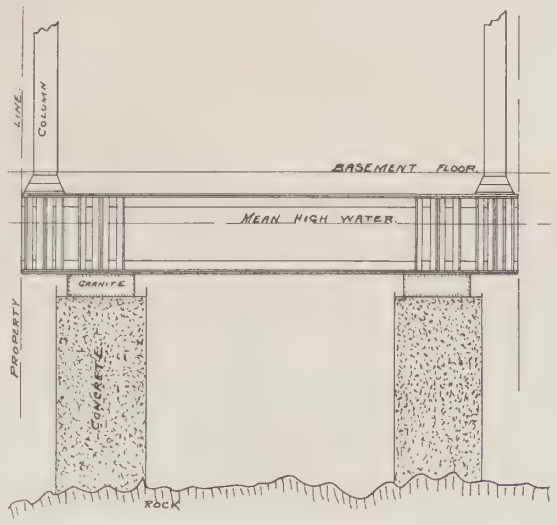


FIG. 1.

When the depth to rock or hard-pan warrants the expenditure, caissons should be sunk by the pneumatic or compressed air process. By this method most of the risks and inconveniences incident to the open caisson method are eliminated or reduced to a minimum. No pumping is required, because the air pressure in the caisson keeps the water back, and if water cannot run in, of course sand cannot either. Then, too, the rock may be thoroughly cleaned off without the use of lagging, no matter how rough or uneven it may be. But it costs money to use compressed air, and the work has to be continued both by night and by day to obtain the greatest economy out of the plant. It is, therefore, an open question how deep the excavation must be to make it profitable to use the pneumatic method. This again depends on the nature of the ground to be excavated and the amount of water in it, because the open caisson work can be carried successfully much deeper in dry soil than in wet. Probably it is safe to say that in alluvial or sandy soil containing much water the open caisson method should not be used further than twenty or twenty-five feet below the ground level.[1] In less dangerous soil it might be used to thirty feet. Beyond this depth, however, it is wiser to estimate on the compressed air method at the outset.

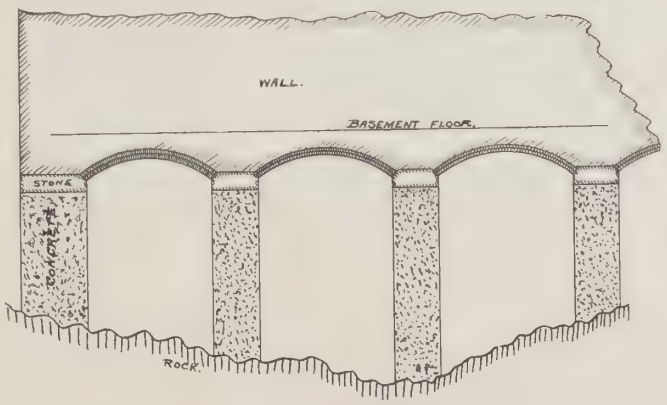


FIG. 2.

[1] By "ground level" is meant the level of the general excavation or the cellar bottom, which is usually twelve to fourteen feet below the street surface.

Reference has already been made in this paper to the fact that the capacity of any bearing stratum depends, among other things, upon its thickness. The angle of repose of any material is the greatest angle at which the material will remain heaped or piled up without sliding. This angle is measured between an element of the sloping surface and the horizontal. As generally calculated, the bearing power of any material is a function of its angle of repose, its density, and its depth or the thickness of the stratum. These last two properties affect the bearing capacity in a direct ratio; that is, if the stratum were twice as thick it would bear twice as much, or if the material in it were twice as dense it would bear twice as much. It is also true that of two kinds of material the one having a greater angle of repose will bear more weight than the other, but not proportionately more.

Another style of foundation very often used where isolated loads have to be taken care of is a pile foundation. Piles are driven in clumps as close together as practicable, but not so close that the last four or five in the clump cannot be driven as far as the first four or five. Of course, the profitableness of pile foundations depends largely upon the kind of material through which the piles have to be driven, and how long they must be to obtain a secure bearing. Then, too, piles cannot be used except in water-bearing soil, and it should be pretty certainly ascertained that the water level will continue to be permanent. This is a somewhat difficult point to determine unless the location is near some body of water which remains at a more or less permanent level. It is then a simple matter to cut off the piles below the lowest water level and start the masonry or concrete at this point. But without some assurance as to the permanency of the water level it is imprudent to use pile foundations. Surface water or surface drainage changes with the different seasons of the year very materially, and the water level in the ground is apt to rise and fall many feet in a short period of time. This action is very injurious to piles or timber of any kind; in a very short time timber under such action will disintegrate and decay, and, of course, piles so injured could not be depended upon to carry weight. This is the chief objection to using piles for foundation work under heavy loads.

Piles should be driven until their points enter the hard-pan three or four feet, especially if the intermediate material is alluvial or spongy soil. In such soil, and in quicksand or other material containing large quantities of water, there is always more or less motion way below the surface of the ground, owing to the variations in pressure from near-by or distant causes. Consequently, piles whose points were not firmly fixed in a hard, immovable stratum would be liable to dislocation from outside forces in the ground. It is thought by some very advantageous to use piles in material of this nature where the underlying stratum is rock, driving the piles down until the points are battered against the rock; but such a method is not to be depended upon. It may work all right and it may not. If the rock presents a sloping surface and the material above it is of the nature just described, liable to motion at times, there is danger that the feet of the piles may slide down the surface of the rock and thus lose their bearing, and even if the rock presented a fairly level surface and the

piles stood squarely on it, there would be some danger that the motion in the material through which the piles passed might displace them or throw their heads (and consequently the foundation itself) out of line. These remarks apply more particularly to short piles, or to localities where the rock is not very far below the surface. Of course, the deeper the rock is, the more material there is above it to hold the pile in position, and therefore the less liability there is that any dislocation will occur. Another objection to driving piles to rock bottom is, that the last few blows of the pile-driver are apt to break the pile some distance from the point, anywhere in fact where the pile is weak. It requires very careful driving to avoid this; the material through which the pile is driven being soft and spongy, when the point strikes the rock the sudden change is so great that it may not be discerned quickly enough by the operator.

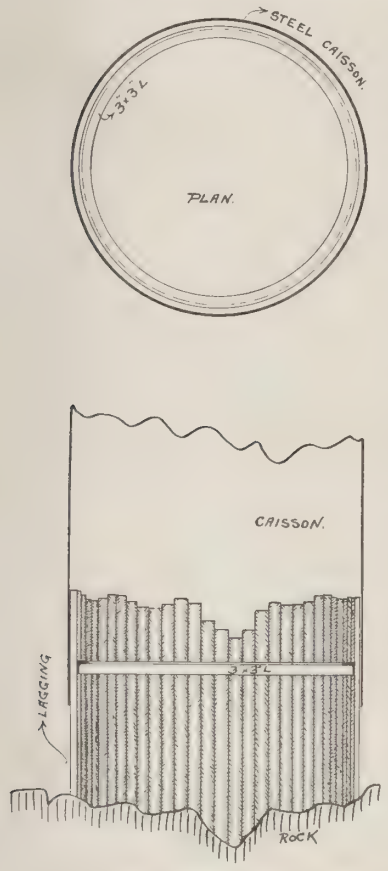


FIG. 3. SECTIONAL ELEVATION.

The usual way of starting the foundation on top of piles is to cut them off at a given level and fill in a solid concrete bed 2 or 3 ft. thick down to a point 18 ins. or 2 ft. below the heads of the piles. On this bed of concrete the masonry is started, or if it is to carry a column it may be covered by grillage beams properly spread over its surface to distribute the load of the column. The amount of load which may be safely imposed upon each pile is in some cities regulated by law, but such a regulation, of course, restricts all cases to the conditions of the worst. Localities differ so much that it is not probable that any two sets of pile foundations constructed in the same manner possess the same efficiency, but it is safe to form a definite conclusion as to the bearing capacity of a pile from its action under the hammer. The usual rule is: —

$$\text{safe load} = \frac{2wh}{S+1} = \frac{2 \times \text{weight of hammer} \times \text{hammer's fall in feet}}{\text{set under last blow in inches} + 1}.$$

There is this objection to the use of any such rule which has to be applied during the progress of the work: namely, that it is not possible to decide in advance just how many piles will be needed and therefore to design the footings with reference to this; but in most cases there is some circumstance from which one may form a fairly correct judgment in advance, and thus approximate the number of piles necessary under each footing. It may be done, for instance, by observing the results of other work in the neighborhood or by comparing samples of the soil with other soil in which piles have been driven. If deemed necessary, a few test piles might be driven to determine the allowance of weight for each. Specifications usually require piles to be driven with a hammer of given weight, falling a given height, until the set under the last blow does not exceed a given specified amount, which has been determined by an application of the foregoing formula for safe load. This works very well where there is a sufficient stratum of hard-pan to receive the points of the piles and embed them properly; but if, as is often the case, the hard-pan is only a thin crust overlying something softer, it then requires considerable skill to stop the pile just at the right point in its downward course, and more often, just as it is thought to be properly set, the last blow will send it crashing through the hard-pan in open defiance of the specification. This only emphasizes the necessity for making preliminary borings or soundings in the case of pile foundations as well as for other kinds.

A very much better although more expensive way of building a foundation in localities where the rock is not far below the surface is to use pipe piles filled solidly with concrete. These pipes, 8 to 12 ins. in diameter, are driven by steady pressure and with water jet, being made up in short lengths, say 4 to 6 ft. each, with the customary pipe fittings on each piece. They are screwed together as wanted, and forced down to a solid bearing on the rock. These pipes, obviously, bear very much more weight than it is safe to allow on wooden piles of the same diameter, and consequently they need not be spaced as closely. When down to solid rock, the bottom should be cleaned off and Portland cement concrete filled in to the top. The heads of these piles should be embedded in a solid bed of concrete similar to the one described, the depth of this bed depending upon the average distance of the piles from each other, so that the farther apart the piles are the thicker the bed should be.

This latter method of footings is an ideal way of underpinning or shoring buildings adjoining which there is to be deep excavation or heavy foundation work (see Fig. 4). Pipe piles may be sunk one at a time and driven down by the use of jacks under the building's own weight. Their distance apart is regulated by the load to be carried, and they should be so placed as to receive this load most advantageously. Such supports as these form the most secure underpinning for a building resting upon more or less spongy or water-bearing soil, which is liable to be drawn away by the operations of the work adjoining. More especially is this true if there is a large underlying stratum of quicksand. Very many buildings are resting upon quicksand, either immediately on or a few feet above it, and in fact such a stratum is perfectly secure and stable so long as it is allowed to remain undisturbed; but as soon as the pressure in the neighborhood is relieved at any point, the quicksand ceases to be confined and moves in the line of least resistance, thereby undermining the actual material upon which the building rests or perhaps the building itself. It is therefore exceedingly necessary to provide carefully for the security of weights or buildings resting upon soil of this nature before any of the pressure in the neighborhood is relieved. In comparison with other methods of shoring buildings which rest upon uncertain soil, the method of pipe-piling is far superior to any. In any system of spur-shoring or needling, the building's weight is merely transferred from one point to another on the same surface, and unless the feet of the shores are resting on stable material, there is just the same danger in undermining them as in undermining the building without them. In fact, to hold a building securely against damage, it must be underpinned to something solid and stable enough to carry its weight without yielding, and furthermore, the underpinning must go down at least as deep as any excavations in the immediate vicinity are to be carried. This can be done thoroughly well and with comparatively little expense by the method of pipe-piling, or "stilts," as it is occasionally called.

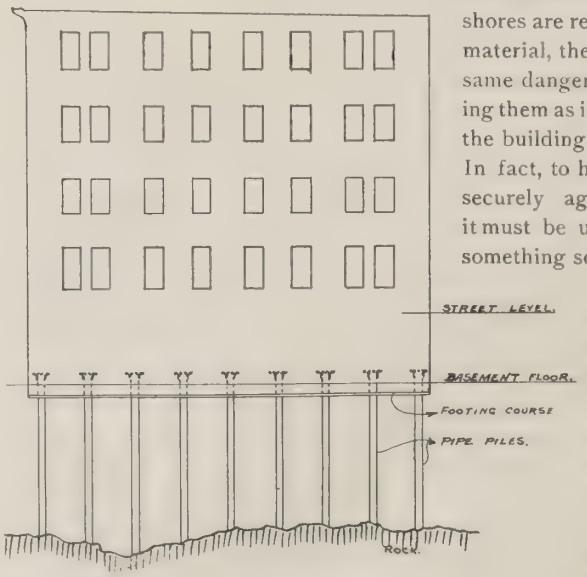


FIG. 4.

A SEVENTEEN-STORY BUILDING TESTED BY FIRE.

THE most crucial test to which a building of typical modern construction has yet been subjected occurred in New York City, a little before midnight, on the 4th inst. A fire originated in the basement of an old-style erection of five stories, stocked with inflammable merchandise. This building stood on the southwest corner of a block, and the fire reached its height during the progress of a wind storm blowing from the northeast. This fiery ordeal was therefore a conclusive one, in point of severity and duration. The facts obtained and observations made by the writer at the scene of this fire on the 5th and again on the 6th inst. suggest a number of important considerations, and will be found to bear out the following deductions:—

First. The fire did not originate in the modern building, but in a structure which had been erected long before the era of fire-proof building. The former had little to fear from fire on its own account, and should one have occurred on any of its floors, there is little doubt but it would have been extinguished by means of the appliances at hand. Certainly it would have been localized, and subdued without serious damage to other parts of the building. The origin, as well as the extent, of the disaster is therefore due, not to the height of the building, or to defects in its construction, but to the proximity of an undesirable and, as it proved, dangerous neighbor.

Second. The omission of iron shutters from the north wall and around the light shaft of the Home Life Building was undoubtedly the secondary cause of the extensive damage which that building sustained. With flames towering up from the seething mass of five stories below, and driven by a fierce wind against twelve stories of plate glass and window sashes, it was, of course, but a question of minutes before they would gain admission to the interior. These windows giving way simultaneously, tongues of flame reached the furniture, fittings, loose papers, and other combustible contents on every one of these floors. The modern building had then to withstand twelve distinct fires of its own, all of which were fed from the sheet of solid flame in which it was enveloped on the outside. Had the window openings been furnished with close-fitting shutters of sheet iron, leaving an air space equal to the depth of the reveals, we doubt whether the flames would have penetrated into any portion of the interior. Doubtless there would have been broken glass, scorched woodwork, and other evidences of a fire that had been held at bay; but the immunity from flame on these twelve floors would have enabled a detail of firemen to remain on each of them, playing water on the inside of the iron window shutters, until the fire in the old building had been exhausted.



HOME LIFE INSURANCE BUILDING, NEW YORK CITY.
Burned Dec. 4, 1898.

Third. Had the Broadway frontage been less pretentious, it would have been more enduring, even when attacked by fire. A free adaptation of French Renaissance detail, carved in the choicest marble, was indeed a thing of beauty — before the fire had calcined the carbonate of lime, and water had reduced it to a hydrate. Our photograph, taken on the day following the fire, gives an idea of the extent to which every projecting member had already suffered. At that time but little water had reached the upper stories, and the utter destruction of the marble will therefore not become apparent until after it has lost all cohesion ("slacked"), which it will do by the immediate action of successive rains, alternating with approaching frost. If allowed to stand untouched, very little of the marble in the upper stories would sustain its own weight during the four months next ensuing.

Fourth. A frontage of terra-cotta and brick walling that had already passed through a white heat in the kiln would have defied the action of the flames, besides affording a corresponding degree of increased protection to the structural steel. We have no hesitation in saying that had these materials been used instead of the more expensive marble, it would have required but a good cleaning down with soap and water to render the Home Life Building the abiding home of its owners. As it is, the apparently casual use of burned clay in the form of tile, hip-roll, and ridge cresting has alone enabled them to retain a roof over their heads. Not a particle of this red roofing tile has suffered, in which respect it stands out in uncompromising contrast with its surroundings.

Fifth. The steel frame remains erect, having stood this remarkable test in a way to dispel doubts as to its efficiency, instead of giving cause for alarm in relation to skeleton construction generally. This fire, so far from being "the death knell of the sky-scraper," has furnished a striking, if not a conclusive, vindication of its safety under the most trying conditions. The superintendent of the building department does not overstate the case in saying that "the firemen would have been blowing up buildings away down below the Astor House in an effort to stop the progress of a conflagration, had there not been such a bulwark interposed between the flames and the blocks below." Our own opinion is, that had the block bounded by Broadway, Murray, Church, and Warren Streets been composed of five-story buildings, such as the one in which the fire took hold, none of them could have escaped destruction. This, we think, will be considered a very conservative estimate, when we recall what happened in Boston, Chicago, etc., during the present generation.

Sixth. With the two fundamental exceptions to which attention has been directed, this building proved that there *is* such a thing as fire-proof construction. It has likewise accentuated a number of things liable to be overlooked or underestimated by architects, in settling the details and selecting the materials to be used in buildings of the class to which it belongs. In the present instance, we have noted what seems to us the two fatal weaknesses to which is due nearly all the damage that has befallen an otherwise successful scheme of construction. With the Broadway frontage executed in architectural terra-cotta, and the rear windows adequately protected, the Home Life Building could have been made equally beautiful and at the same time invulnerable. Now that the upper half of the frontage overlooking this famous thoroughfare will probably be rebuilt, we venture to offer these belated reminders on the principle that capable men can afford to admit their mistakes, and wise men always hasten to correct them.

T. CUSACK.

REPORT ON HOME LIFE BUILDING FIRE, NEW YORK, DEC. 4, 1898.

BY CHARLES J. EVERETT, JR.

CONTRARY to popular opinion, the recent fire in Rogers, Peet & Co.'s large clothing store, and in the adjoining "sky-scraper," furnishes evidence of the efficiency of progressive fire-proof construction, notwithstanding the fact that in some respects the building was not the most advanced type of modern fire-resisting structure, as will be pointed out further on. A change of plan by the owner, doubling the width of the building after reaching the sixth story, rendered necessary certain modifications of detail, and increased the burden of the architects, who are rarely free agents in such matters.

The block on Broadway, between Warren and Murray Streets, was occupied by three buildings, namely, Rogers, Peet & Co.'s five-story store on one corner, the fourteen-story Postal Telegraph Building on the other corner, and the Home Life Insurance Company's building filling the space between. The Home Life Building is a steel frame structure of fifteen stories, surmounted by a tall, wedge-

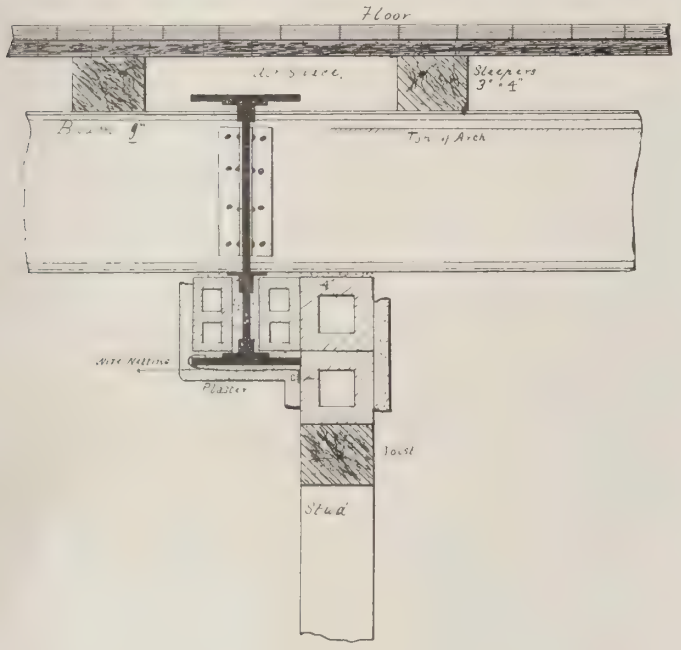


FIG. 1.

shaped tower, and was erected in 1894, from designs of Messrs. N. Le Brun & Sons, architects.

On the night of December 4, at about ten o'clock, fire started in the first story of the store of Rogers, Peet & Co., during a furious northeast gale, which at times reached a velocity of over sixty miles an hour. The flames soon broke through the roof of the building, and were driven by the strong winds against the lofty walls of the Insurance Company's building, rushing up the light shaft, which formed an excellent chimney extending 150 ft. above the roof of the clothing store. Two sides of this light shaft consist almost entirely of window openings unprotected by iron shutters, and the third or rear side shows two windows to each floor, likewise unprotected. The main wall of the building on the same north side also contained two windows at each story, without shutters. The flames from the clothing store, beating against all these windows, shivered the glass, ignited the sashes and frames, and urged by the strong gale, soon filled every story of the taller building above the seventh floor with a mass of fire. This assault from the outside made it impossible for the firemen to fight the flames within the Insurance Building until the clothing store was entirely consumed.

The floor construction of the Home Life's building was 9 in. beams in the front portion and 12 in. beams in the rear, spaced about 4 ft. 6 ins. apart, and 9 in. hard tile terra-cotta side-construction arches between beams. The lower flanges of beams were pro-

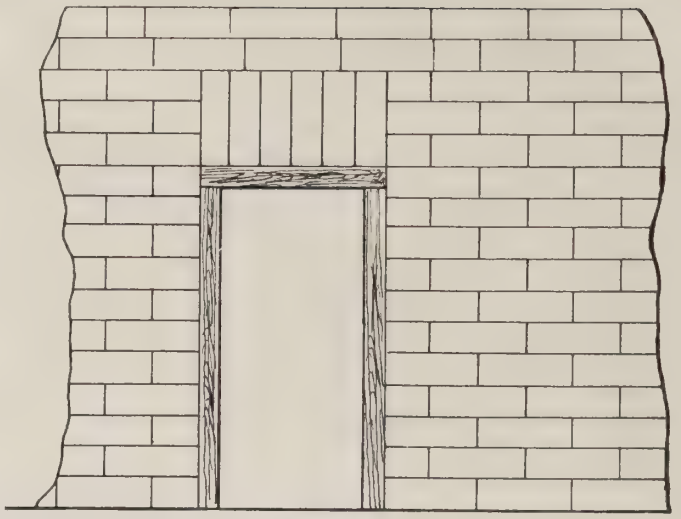


FIG. 2.

tected by skew-backs with protecting lips. The floors were of two thicknesses of ⅞ in. boards nailed every 16 ins. to 3 by 4 in. sleepers laid on beams. Little or no concrete was used over arches, thus leaving a free air space of about 4 ins. in front and 7 ins. in rear, between the top of arches and the wood flooring. The absence of concrete filling over arches left the upper flanges of beams exposed for, say, 1 in. and those of girders for 2 ins. in front portion of building, and still more in rear. While none of these exposed flanges appear to have been injured by fire, except on the fifteenth floor, they escaped only by reason of the limited height of exposed metal, as demonstrated by results on fifteenth floor, mentioned further on. Over a large part of the building above the seventh story the flooring and sleepers were entirely consumed. This air space beneath the floors insures the destruction of all combustible floor material. It should be entirely filled with incombustible matter.

The partitions were of 4 in. porous terra-cotta tile, and the column covering and furring was of same material 2 ins. thick. The partitions rested directly on the arches, or on a ridge of concrete brought to a level with the top of beams, so that there were no fire-runs under the partitions, as has been stated by some critics. The hall partitions, as is usual, did not extend to the ceiling, windows with wooden frames filling the upper 3 ft. or so. The columns were



FIG. 3.



FIG. 4.

covered with 2 in. porous tile blocks ribbed at backs to allow a partial air space. The lower flanges of important girders which projected below ceilings were covered with wire netting and plaster, or mortar, rather.

As the building was practically gutted from the eighth floor to the roof, it is unnecessary to describe the condition of each floor after the fire.

In many of the rooms the fire consumed everything combustible, including all door and window frames and casings, all floors and sleepers. The heat was strong enough to warp and twist ironwork, such as steam and water pipes, typewriters, etc., and in one room the brass of a light bracket was melted; yet the terra-cotta arches (of hard tile), the furring and column covering (of porous tile) were uninjured, and with a very few exceptions, the floor arches are in such condition as to require little or no repair. The first exceptions are where safes resting on floors between beams were dropped a distance of several inches, through the free air space just condemned, on to the tile arches, by the burning away of the flooring. In one instance a safe weighing about two tons fell through the tenth floor into the office of the Rapid Transit Commission on the ninth floor and there stopped. The tile arch directly under the falling safe was knocked out, but the double wooden floor, and the fact that one edge of the safe struck the side of a girder, stopped further descent. The second exception occurs in the rooms on the fifteenth floor, on west side of light shaft, where an entire panel of arch has fallen, and the remaining arches between it and the stairs are bellied so as to necessitate removal. The 12 in. beams of this section are found to be sagged. The failure of these beams can only be due to the heating of the upper portions, which were exposed for a height of 4 ins. above the arches, as the lower flanges of some of them are still well protected by the tile. Some other arches appear to be slightly bellied, and in some places the lower webs of single blocks are cracked off; but the condition of the arches, taken as a whole,



FIG. 5.



FIG. 6.

indicates a splendid resisting power and adequate protection of metal from a very hot and prolonged fire.

This fire warns us against the use of wire netting and plaster for protecting beams in the manner here applied. (See Fig. 1.)

The webs of all girders were well protected underneath by tile blocks supported by lower girder flanges, but the girder flanges depended for protection upon wire netting bent around them and then plastered. Where the wire netting was thus bent around both sides of flanges it held itself in position, but in some cases the netting was nailed on one side to the porous partition blocks, as shown in Fig. 1. In the hall partitions the upper blocks were supported by the wooden framing of the partition windows, and, of course, fell when this framing was burned, and pulled down with them the protecting plaster coat, exposing the girder to the fire. This, however, could hardly have occurred until after the fire had begun to subside, since the girders show no marks of injury; but had the fire continued after the netting fell, some of the main girders must have failed by reason of their lower flanges being exposed for a length of 10 ft. or more.

In general, where the fire played strongly against plastering it fell off from walls and ceiling, and the plaster on the under side of the wire netting likewise dropped off, leaving only that portion which was pressed through on the upper side of the netting to protect the metal framing. In some instances the netting hugged the metal so



FIG. 7.

closely at some points that there was no room for protective plaster on the inner side, and practically left the metal without protection.

Wherever this method of fire protection is adopted, a space of at least 1 in. should always be preserved between the netting and the metal requiring protection, and this space filled with the coating of plaster, etc. Without this precaution the supposed protection may be entirely useless.

Referring again to column covering, the porous tile preserved the plate columns from injury in every case; but in many instances the cement bond of the joints was broken, and the tile must be reset.

The growing opinion is that no air spaces should be left around columns, but that the covering blocks should be set directly against the metal and made as solid as possible with mortar or cement.

Fig. 3 shows condition on the eighth floor after the fire.

Fig. 4, the office of the Rapid Transit Commission on the ninth floor, showing the two-ton safe that fell through from floor above.

Fig. 5 shows one of the main columns on the eleventh floor after being stripped for inspection.

Fig. 6, fourteenth floor; showing arches, girders, and column covering, all in good condition.

Fig. 7, fifteenth floor; west side of light shaft, showing the floor where the whole panel fell, and where the 12 in. beams are bent.

Fig. 8, fifteenth floor; showing the most seriously injured steel member. This is the middle section of the 24 in. by 10 in. plate girder, that crosses the Broadway front of the building. The other two sections of the girder are also distorted, but in a less degree. The upper flange was about 10 ins. above the floor, and by an oversight had no fire protection. The upper flange and upper part of the web of this girder were sufficiently heated to buckle and deflect sidewise; this caused it to twist enough to loosen the fireproofing from the lower flange. The girder has sagged somewhat under its load, and appears to have been very near to the point of collapse.

On cooling, the flanges being bent, the original length was decreased, and the strong end connections pulled the sides of the columns slightly out of line. This appears to be the greatest damage sustained by any part of the metal frame, and is entirely due to absence of fire protection.

There is room for great improvement in the construction of partitions within buildings, that is, for partitions so constructed that they will not tumble down as soon as subjected to attacks of fire or of water. Fig. 5 gives an idea of the destruction of these flimsy partitions. To prevent the falling of the blocks over the doorways as soon as the wood frames are burned, the tile manufacturers recommend constructing flat arches over the doorways by setting the blocks on end, as per Fig. 2.

A lesson taught by this fire is that no unprotected metal of extended and continuous lengths should be employed upon the external walls of buildings. The windows of the light shaft were furnished with cast-iron sills, lintels, and mullions. The sills and lintels were 23½ ft. in length. The fire, drawing up past and into the windows, heated and expanded these iron members, in some places sufficient to force the brick wall, that extended 18 ins. beyond the iron, about an inch out of line, and crack it. If we figure the expansion by heat of a bar of iron 23½ ft. long we find that an increase of 350 degrees in temperature will produce an elongation of about $1\frac{1}{16}$ in.

The Home Life Building in its present condition furnishes a very interesting study for the engineer, and it affords proof of the theory that a steel structure may be so protected by other material as to resist fire without material injury.

From the foregoing facts the following conclusions may be drawn, namely, that in a really fire-proof building: —

First. The steel framing should be entirely protected by burned clay or its equivalent.

Second. No combustible materials should be used for floors, doors, door frames, window frames or sashes.

Third. Partitions should be so built as to resist ordinary impacts and pressure of a fire stream.

Fourth. Wire glass should be employed for partition lights and for door lights.

Fifth. Column covering should be more strongly bound together.



FIG. 8.

Sixth. No continuous or extended lengths of iron should be employed in the external walls.

Seventh. All window openings, liable to be exposed to fire from without, should be provided with shutters of iron or some better fire-resisting material.

The Bonding of Brickwork.

BY ERNEST FLAGG.

ONE might say, with a good deal of confidence, that nothing is more certain than that the next few years will witness a great change in the methods of bricklaying in this country. The principles of good design are being so rapidly introduced among us from France, that the present standard of taste in brickwork and also in the use of many other building materials must give way to more reasonable methods. These principles of good taste in design are so simple and reasonable that any child may understand them, and when once understood, they are sure to be applied.

One of the first things that the student of architecture at the French National School has impressed upon him is that good design calls for the use of reason, or let us say common sense, on the part of the designer. A great work of art is necessarily a great achievement of the intellect. Such a work calls into play the highest powers with which we are endowed. Reason must play an important part. Nothing is more sure than that no work of man can be called great which does not show the use of this wonderful gift, which is the measure of man's superiority over the lower animals.

Now, in none of the fine arts is there so great an opportunity for the use of reason as in architecture, and it is doubtless because of this, no less than that it is the mother art, that it has always been considered among the most artistic and enlightened nations of Europe as the chief of the fine arts. The architect is called upon to use his reasoning faculties at every turn, and the success or failure of his work depends upon the use he makes of them. Some there are who have an innate sense of what is admirable, and apply their reasoning powers to their work almost unconsciously. These are they who create masterpieces, and of whom we say they are endowed with genius.

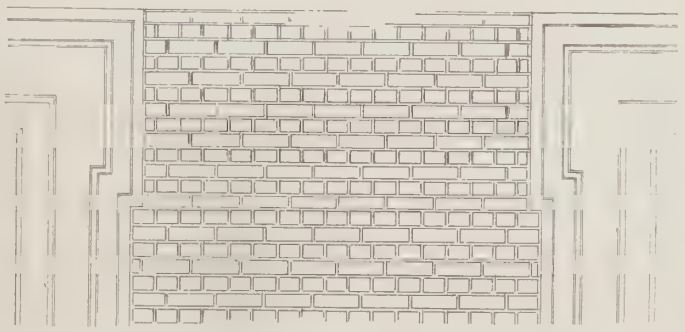


FIG. 1. BRICKWORK FOR SINGER BUILDING.

Joints Recessed ⅜ Inch.

The architect deals with many different materials, and applies them to many diverse purposes. Each of these materials has certain qualities and limitations which he should understand. These qualities and limitations suggest and call for the use of certain appropriate forms and methods of use prescribed by reason or common sense, as adapted to the material for the purpose for which it is used. The knowledge of these qualities and the humble submission to the limitations which common sense dictates is a great aid to the designer, for if he will humbly follow where reason leads the way, all sorts of interesting forms and methods will suggest themselves as appropriate, which otherwise he might not have thought of. Moreover, he will feel safe in their use, for he will know that he is being guided by a true principle of good taste.

A striking illustration of what I mean is often seen in the use of wood in exterior work by architects of our colonial times. The resources of the builders did not permit of the use of stone where it is generally used abroad, and wood was substituted for it, but this substitution involved no slavish imitation of the stone model. The work generally shows that the architect had a keen and logical appreciation of the nature of the material he was using, and its capabilities and the designs are designs for wood, not for stone. Retaining the main features of the classic forms which are founded upon the eternal principles of common sense, he varied the detail in an endless number of ways appropriate to the nature of the material, thus securing a charming variety of fresh and interesting forms, and by the most simple means giving to the work a stamp of good taste and elegance which to see is to admire.

The very common disregard of this principle, which is one of the fundamental principles of good design, is a most glaring defect in much of our modern work.

On every hand one sees in our modern buildings, the dictates of common sense in the use of materials violated, and nothing is more certain than that until such abuses are corrected we need not expect good results, either from the artistic or practical standpoint. How can one expect, for instance, to crown a building with a sheet-metal cornice to which has been given a stone profile, and expect his work to be classed as a work of art? Common sense is violated; the thing is unreasonable on the face of it and cannot possibly be good. If the limitations of cost prescribe the use of sheet metal for the cornice, why should not that material be frankly used in a common-sense way and be given a form adapted to its qualities and limitations, so that it will appear to be what it is? When a man who is acquainted with the qualities and limitations of sheet metal sets himself to work to think how he can make use of this knowledge in designing a cornice that is appropriate to the building, in forms that are appropriate to the material he intends to use, all sorts of new forms and possibilities will suggest themselves to him, and he may accomplish a result truly artistic, for it will at least have in it one of the principles of good taste, that is to say, truth.

Or, as another illustration, say the architect wishes to use iron for a column; how can he expect a good result if he gives it a form which would be suitable for stone, when the nature of the material calls for an entirely different treatment? To do so is to violate the laws of common sense, and he can hope for praise only from those who are deficient in that quality, or from the ignorant.

It ought to require no argument to convince any one that to each material should be given the forms and profiles adapted to its nature. Profiles suitable for granite are unsuitable for marble, and *vice versa*; profiles suitable for a soft stone are unsuitable for a hard one. Forms adapted to wood are not adapted to iron, and forms suitable for iron are not suitable for stone. Cast iron calls for forms of one kind and wrought iron for forms of another kind, and so on indefinitely through the whole list of building materials. To each material should be given the forms adapted to its qualities and limitations, and only by so doing can one hope for good results. The study of each material will suggest new possibilities, and the designer, letting his reason dictate, may venture in safety upon new and interesting fields of design.

His work will be interesting because it will display the working of the human mind and will appeal to the reason of those who see it. This principle of good design should be inculcated into the architectural student at the very beginning. Unfortunately, it is a principle which he will see violated on every hand by men standing high in the profession, whose works are admired by the unthinking or ignorant. But the progress in art in this country is going to be rapid, and not many decades will pass before it will be pretty thoroughly understood here, even among the laity, as it is understood in France, that common sense is a necessary factor in good design; and a man, to stand high in the profession, will find it necessary to call into play all the highest qualities with which the Almighty has endowed him.

In the use of none of the building materials in this country are the principles of common sense more generally disregarded than in brickwork. In the use of this material we easily lead the world in absurdity. So true is this that good brickwork is a thing practically unknown among us, or perhaps one should say unpractised among us, for every one who knows anything about brickwork, or

who has given the subject a moment's thought, knows that the nature of the material requires that there should be practically no vertical joints more than one brick high, but that every brick should interlock with the surrounding bricks both lengthwise with the wall and transversely through it; in other words, that the brick should be laid up in regular bond, of which there are several standard varieties, and which the apprentice everywhere but in the United States is supposed to be taught. With us, workmanship of this character is deemed unnecessary, and our brickwork consequently loses in strength and character, both artistically and constructively, for it lacks a quality of solidity and technique which in good workmanship impresses itself upon the imagination and constitutes a real beauty. So utterly has this common-sense principle of good workmanship in bricklaying died out among us that it is next to impossible to find a mechanic who can lay up a wall in regular bond. In a large force of bricklayers, all passing as skilled mechanics, the writer has often been unable to find one who knew how to lay up a wall all the way through and at the corners in regular bond. Every fifth course a header course, for rough work and backing, and that abomination known as diagonal bond and microscopic joints for the face work, is what now passes here as good workmanship.

Every now and then one reads of the collapse of some building finished or in process of construction; those casualties are usually ascribed to the use of poor material, but in nine cases out of ten they are due to improper bricklaying. New York is full of buildings which stand apparently in defiance of the laws of statics, and doubtless the same conditions exist in other places; it is extraordinary that there are not many more accidents than there are. If provisions were made for the proper bonding of brickwork in all building laws for cities, these accidents would be almost unknown.

In the United States if a building lasts fifty years it is about all that can be expected of it; they are mostly constructed on thriftless principles of economy. The builder loses sight of the fact that for a very slight increase in the cost, or for a little more care in the construction, the life of a building can be almost indefinitely prolonged, and that the saving in repairs alone will far more than offset the increased expense. When in Paris, the writer lived in a building erected in the time of Louis XIII.; it had recently been remodeled at a slight expense, and was as good as new and may be used for hundreds of years to come. The first cost of building in this way was perhaps 10 or 15 per cent. greater than it would have been if built for a life of fifty years. One would think that common dictates of economy would introduce this sort of construction here.

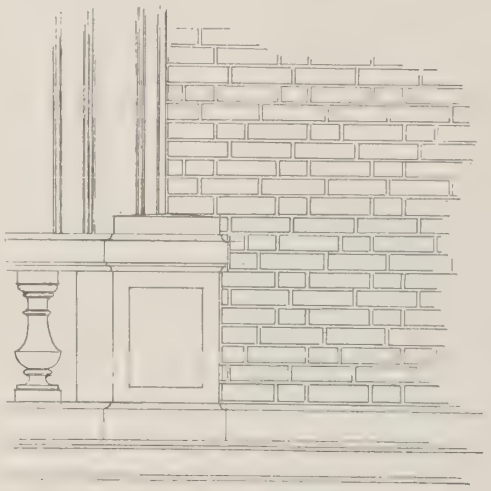


FIG. 2. BRICKWORK OF HOUSE FOR CLARK ESTATE.

The practise of running up certain walls or parts of walls of a building in advance of others is another practise which should never be tolerated by the architect. It is nevertheless a practise which is so common here that one may say it is the general custom to carry up the walls which are composed entirely of common brick in advance of the ornamental façades, and then to connect the two by means of an abomination in bricklaying called toothings. The workman accustomed to laying up his work without proper bond sees nothing inconsistent or slovenly in such a proceeding. It is, indeed, on a par with the rest of the work, that is to say, about as bad as could be contrived; but how can an architect who takes pride in his work permit such practises? They are proceedings which could only be tolerated where pride in good bricklaying is unknown, and that they are common now serves as clearly as anything could to show the present degradation of bricklaying in this country. They are makeshifts, which result from a mistaken notion on the part of the builder that by resorting to them he can hasten the work, but it is evident that the building cannot be inclosed or finished until all the walls are up, and if one part is carried up before the rest nothing is gained. The supposed gain is entirely imaginary, and is accomplished at the expense of good workmanship and in defiance of the common-sense laws of good construction.

It needs no argument to demonstrate that the way to build well is to carry up all the walls simultaneously, interlocking all the materials as the work proceeds. To do otherwise involves an unequal distribution of weight on the foundation during the process of building, which should not be tolerated even if it could be done consistently with good bricklaying, but when this is done in connection with the so-called toothings, it cannot be too strongly condemned.

In the manufacture of fine grades of brick, our progress during the last twenty-five years has been very rapid, and we now produce them in extraordinary variety and of most excellent quality. Strange to say, this progress in brickmaking has not conduced to progress in bricklaying, but rather the contrary. The fine grades are used only for face work, and our designers, losing sight of the fine effects which might be produced by laying them up in regular bond with the backing, have used them solely as a veneer, independent of the main body of the wall, and adding practically nothing to its strength. They are laid in a sort of running bond and are tied to the backing at every fifth or sixth course by what is called diagonal bond. That is, their inner corners are clipped off and the corners of common brick laid diagonally on the wall are lapped over the face work, a process as insecure and slovenly as it is ugly, for by this method the outer veneer has little or no connection with the body of the wall, and looks as if it had absolutely none, appearing to be what it is, weak. The writer has often noticed workmen in taking down old buildings—buildings which would be called new anywhere else—remove great slabs of this outer veneer with a crowbar, showing that there was practically no bond between it and the backing. It seems incredible that such unscientific and inartistic methods could take root anywhere to an extent that architects will deliberately specify this sort of thing; but one who observes our progress in other directions must have far too much faith in the future of good art and its handmaiden, good workmanship, among us to believe for a moment that these methods will endure. At present, this way of laying brick, considered very ugly everywhere else, seems to be admired here. It was first adopted through false notions of economy, but we now find it used almost everywhere in buildings where such considerations evidently did not govern, as well as in buildings of the cheaper kind.

With the introduction of the fine grade of bricks, we have developed a love for fine joints, and this class of work is laid up with joints so thin as to be of no use constructively, and which rob the work of all character, and give to it a hard, dry, sleek appearance, which can appeal to no artistic instinct. Now and then we find an attempt at Flemish or English bond, doubtless made by some one who has seen and admired the genuine article abroad or in old buildings, in this country, but almost all such attempts are sham, for the face is not really bonded to the backing. The headers are not headers, but bats, because the designer cannot bring himself to give up the small fine joints, and to use joints of a size which is necessary to insure good workmanship; with the thin joint retained it is impossible to interlock the face work with the backing. In other words, our brickwork is laid upon the theory that honesty is inconsistent with art. To vary the general monotony sometimes recourse is had to bricks of peculiar shapes, such as the long, narrow, thin bricks called Roman, which do not and could not bond with the backing. Many people think this variety truly artistic. Few seem to realize that the finest

and most artistic effects can be produced by simple means, or to understand what needs only to be tried to be proven, that brick of the commonest kind laid up in interesting and logical bonds will produce far finer effects than the most expensive bricks or the craziest shapes that ever were made, if laid up without regard to the rules of common sense.

One has but to try to find how easy it is to devise all sorts of interesting patterns and endless varieties of beautiful wall surfaces by the use of brick of the standard size regularly bonded to and forming an integral part of the body of the wall. The supposed economy of the present methods, like many other thriftless attempts in the same direction not founded on reason, which spring up in new countries, will be found upon examination not to be economical, but the reverse. With a very slight increase in the number of face brick, the outer 4 ins. of the wall, now practically useless, can be made to contribute its proportionate share to its strength. Let us make some calculations to show how slight is this increase, and how out of all proportion to it is the saving effected. In New York face brick is generally laid up ten courses to 25 ins. and common bricks nine courses to 2 ft. If the face brick is made to bond with the backing, it too will lay up nine courses to 2 ft., or better still, for face brick and backing, nine courses to 25 ins.; then 8.64 face bricks and 10.8 common bricks will be required to each square foot of a wall 1 ft. thick. By the common method there would be required to accomplish the same result 7.2 face bricks and 13.5 common bricks, so that by the use of 1.44 more face bricks, against which there is a saving of 2.7 common bricks, we obtain a wall which is practically one third stronger, for the outer 4 ins. is an integral part, whereas in the other case it is a veneer of little or no value as regards strength.

This calculation is made upon the supposition that for every stretcher there is used a header (Fig. 1); but, if greater economy in the use of face brick is required, good results may be obtained, and interesting patterns devised, by the use of a less number of headers in proportion to the stretchers (see Fig. 2), where one half as many headers are used as in Fig. 1. In this case a square foot of wall surface 1 ft. thick would require 7.56 face bricks and 11.88 common bricks, so that this would require only .36 more of a face brick, against which there would be a saving of 1.62 common bricks.

The taste for good workmanship is fortunately a taste very easily acquired; familiarity with it breeds a desire for more, and when the difference between the appearance of good bricklaying and bad bricklaying is once understood, the demand for the former will spread rapidly. There is now urgent need for good manual training schools where young mechanics can be taught good workmanship in bricklaying; or rather, perhaps one should say, there is urgent need that good bricklaying should be taught in the manual training schools which are already established. It ought to be no more expensive to lay up brick in regular bond than by the "every fifth course a header course" system. That it is more expensive to do so is entirely owing to the fact that the bricklayers are unskilled in the art of good bricklaying. They do not know how to lay the regular bonds because they have never been taught, and if they attempt to do it, of course the progress is slow, and time means money. But if the architects would specify work of this character, there would soon spring up a demand for skilled workmen, and the mechanics would soon adapt themselves to the new conditions; it would soon be demonstrated that good bricklaying costs no more than bad bricklaying, and the benefit both from the artistic and constructive standpoints would be worth a thousand times the cost of introducing this reform.

In the large Eastern cities there is fast being created a great body of skilled mechanics in almost every line, except bricklaying, that has to do with building. This has come to pass because there has been a demand for fine workmanship which has been specified regardless of expense. The building up of these industries and the creation of this body of skilled labor has been of incalculable benefit to the country, and is worth a great deal more than it has cost. Bricklaying is the only building industry which seems to have made rather the reverse of progress during this century.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK. — The year of 1899 promises to be an exceptionally busy one, if the amount of work which has been postponed on account of the war is any criterion.

In the meantime architects are preparing in every way to make the Fourteenth Annual Exhibition of the Architectural League a great success. In connection with this exhibition two prizes and a gold and silver medal will be awarded to winners of three competitions, details of which are given elsewhere in this issue.

Among items of new work may be mentioned: —

C. L. W. Eidlitz, architect, has planned a four-story brick telephone exchange office to be built on East 30th Street; cost, $30,000.

H. T. Howell, architect, has planned a seven-story brick apartment to be built on 90th Street, near Central Park; cost, $95,000.

Mr. J. Pierpont Morgan has purchased for $148,000 a site for a new club house for the New York Yacht Club, and presented it to the club; $75,000 has been subscribed toward the building itself, and a limited competition is now being held, in the result of which considerable interest is felt. Among the architects who have been invited to compete are Charles C. Haight, Carrere & Hastings, and McKim, Mead & White.

PHILADELPHIA. — The recent Peace Jubilee has left the desire in many minds to have a permanent memorial erected in the heart of the city, — a memorial that would not only serve to keep fresh before us the successful termination of war, but one that would, in addition, be an architectural ornament to the city. The public were intensely pleased with the Jubilee Court of Honor, designed by Joseph M. Huston, architect, consisting of an arch spanning Broad Street with what was really a court north and south of it, formed by detached triumphal columns. At first blush an outcry was made to have this reproduced in white marble (the original being staff), but this was, of course, out of the question, both on account of expense and inconvenience resulting from blocking



TERRA-COTTA FIGURE, RITTENHOUSE APARTMENTS, PHILADELPHIA.

Executed by the Perth Amboy Terra-Cotta Company. Willis G. Hale, Architect.



RESIDENCE FOR HARVEY CHILDS, JR., ESQ., PITTSBURGH, PA.
Peabody & Stearns, Architects.

the sidewalks of a main street. Then came suggestions for various substitutes, which gave architects generally grave fears for the outcome. The T Square Club pledged themselves to give a handsome subscription, and it is the hope of all, that, should the memorial finally be built, the leading members of the club may see to it that some entirely satisfactory design be selected.

Architectural exhibitions have been growing year by year more and more important, and perhaps in no city has this fact been more noticeable than in Philadelphia. For years the Pennsylvania Academy of the Fine Arts had been running an architectural exhibit, but only as an aside to its annual fine arts exhibition, and architecture was gradually becoming very poorly represented, until a few years ago the T Square Club assumed charge. The improvement was immediate and lasting, for each year's exhibit has been an improvement, both in quantity and quality, over the last. The entries for this season's exhibition are now in and promise to keep up the advance. It would seem that one helpful adjunct to the usual array of original drawings of current architectural work might be found in the best of the architectural magazines, the latest yearly volume of each of which could be placed convenient to the hand of the visitor, thereby giving him a broader view of architectural achievement.

Mr. Frederick M. Mann, architect, who, within the year, has allowed the calls of his practise to take him away from professorship at the University Architectural School, has just been successful in a most fairly conducted competition for a church at Overbrook. As showing the proper feeling that exists amongst architects here, it may be stated that after the award was made, an exhibition of the competing designs was held by permission of the competitors, when Prof. Warren P. Laird, who had acted as adviser to the church committee, gave an interesting talk on the method that had been followed in getting up the terms of the competition and in the decision. It seems that the interested members of the profession met, when a draft of the proposed terms was laid before them, and their criticism and suggestions taken before the terms were finally adopted. Professor Laird deprecated the fact that there were eleven competitors instead of from four to six, as he would have wished, but the committee had, in the main, followed his ideas of equity, outside of this one point. Cope & Stewardson were placed second, and David K. Boyd, third.

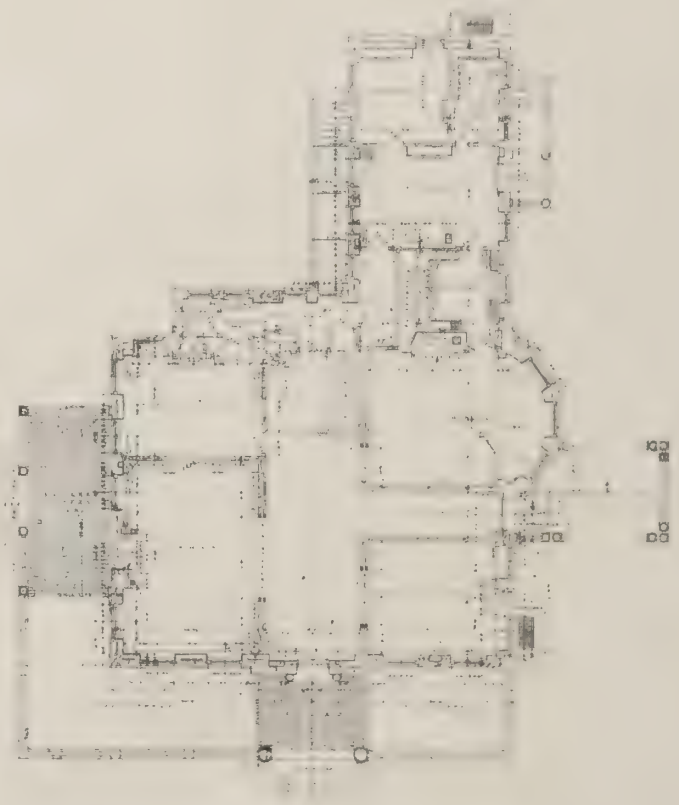
A new front for the Academy of the Fine Arts building on Broad Street is reported from the office of F. M. Day & Bro. All familiar with the present façade will be curious to note the change.

Cope & Stewardson's design for the new law school at the University of Pennsylvania is about to be put into execution. To be built in the neighborhood of the dormitories, by the same firm, its material will be approximately the same, while the architecture is of a later period of English Renaissance. Like the dormitories, the cornices, window frames, etc., will be of light stone, while the body of the walls is of reddish brick with Flemish bond.

Mr. Seeler is about to put up the east portion of his high building at Broad and Chestnut Streets, for the Real Estate Trust Company. This building, although of one continuous design, had to be built in two sections, on account of an unfinished lease on part of the old property.

MINNEAPOLIS.—I was impressed, upon reading the current BRICKBUILDER, with the very general sentiment as to next year's business promises. All reports indicate a stagnation just at present, but the prospects for 1899 are conceded to be the best for years. So it seems to us here in the Twin Cities. While the past year has been a disappointment to most of us, perhaps, we can readily understand it when the eventful year now closing is considered. No doubt the enforced quietude of the past two or three years will result in a healthy forward movement that will average matters up in an eminently satisfactory manner.

The closing up of the year's work is practically all that is stirring with us to-day. Winter has set in at an earlier date than for several years past, so nothing new of importance will be undertaken now before spring. The new Milwaukee depot is now being used, although not entirely finished. It is a credit to its owners and a sub-



FIRST FLOOR PLAN, HOUSE FOR HARVEY CHILDS, JR., ESQ., PITTSBURGH, PA.
Peabody & Stearns, Architects.
(Scale Drawings of Elevations shown in Plate Form.)



EAGLE ON DOME OF PUBLIC LIBRARY AND MUSEUM, MILWAUKEE, WIS.
Executed in Terra-Cotta by the Northwestern Terra-Cotta Company. Ferry & Clas, Architects.

stantial addition to our business architecture. The residences of George T. Partridge and S. A. Harris are nearing completion, and will rank with our finest residences. They are all of Roman buff brick and terra-cotta and mark a substantial advance in our development as a city, a foretaste of what is to come. Our new State Capitol is nearly ready for roof framings and is a decided credit to the State. The periodical agitation looking to completion of our new City Hall has set in, and we hope this time it will result in something tangible, as it is a much-needed improvement.

Among the projects for next year that are known to date are: a new chamber of commerce, three or four new churches, two or three new school buildings, two new buildings at State University, hotels, warehouses, store and office buildings, and residences, etc., almost innumerable. We are promised a new government building in the near future, a promise we fervently hope to see fulfilled. Our present building has never been adequate, the business having outgrown the building during its construction. We trust, in the event of a new building, to see it made the subject of local competition and awarded to a Minneapolis man. We know it will mean a better adaptation to necessities and more vigorous prosecution of the work, as well as a substantial saving in cost.



SEAL OF NEW JERSEY, EAST ORANGE TOWN HALL.
Executed in Terra-Cotta by the Conkling, Armstrong Terra-Cotta Company.
Boring & Tilton, Architects.

ST. LOUIS. — At a special meeting of the St. Louis Architectural Club, held on October 22, the constitution and by-laws were so amended that the annual meeting will be held the first Wednesday in April hereafter instead of January, and the monthly meetings on the first Wednesdays of each month instead of the first Saturdays. The changes were thought advisable that the social features, which still occur on the first Saturday evenings of the month, might not be curtailed or of themselves interfere with the business meetings, while the annual meeting will take place at the close of the working season, that it may not interfere with the club work by a change of administration.

An important event in the history of the local Young Men's Christian Association was celebrated on November 30, in the formal dedication of their new building, corner of Franklin and Grand Avenues. It is five stories, fire-proof, and cost $200,000. Tully & Clark were selected architects, through a competition held in the spring of 1894. Work was commenced at once, but the financial depression prevented raising sufficient money to finish it until this season. The secretary's office and general reception room, reading room, etc., are on the second floor. The gymnasium is in the rear, extending from basement to second floor, and above this is the main auditorium, with a seating capacity for one thousand. Swimming tank, baths, bowling alleys, etc., have been provided in the basement. The roof has been designed for use for summer concerts, etc.



TERRA-COTTA FIGURE, RESIDENCE AT KANSAS CITY, MO.
Executed by the Winkle Terra-Cotta Company.
F. E. Hall, Architect.

During November the Board of Education, W. B. Ittner, architect, took out building permits for a three-story school, 106 by 90 ft., cost, $69,000; a two-story school, 28 by 90 ft., cost, $15,000; and a two-story school 100 by 50 ft., cost, $30,000.

It is with considerable embarrassment that St. Louis acknowledges that she cannot get that which she most needs; and her confession is the strongest evidence that she needs it. Two unsuccessful attempts have been made to vote a half mill on the dollar tax for five years, for the purpose of erecting a public library building. The present building is wholly inadequate, either for the service required or as a proper protection, it being neither fire-proof nor designed for the purpose, it having been arranged for the library when it was merely the public school library. Since becoming a free library it has grown greatly and should have a permanent home.

Messrs. Barnett, Haynes & Barnett have prepared plans for a $150,000 residence in Belle Place, and architect Louis Mullgardt has an apartment house on the boards, to be built opposite the Grand Avenue entrance to Vandeventer Place, at a cost of $30,000.

CURRENT ITEMS OF INTEREST.

THE WINKLE TERRA-COTTA COMPANY are furnishing the architectural terra-cotta for the new armory building at St. Louis,



TERRA-COTTA PANEL, CONVERSE BUILDING, BOSTON.
Executed by the Excelsior Terra-Cotta Company. Winslow & Wetherell, Architects.

also for the Reliance Realty Company's new office building (eleven stories), 6th and Olive Streets, St. Louis.

THE KITTANNING BRICK AND FIRE CLAY COMPANY have secured an order for interior linings for Allegheny County House, Woodville, Pa.; also have brick specified for interior of St. Francis de Sales Church. McKee's Rocks, Pa.



TERRA-COTTA PANEL.
Executed by Gladding, McBean & Co., San Francisco, Cal.

THE POWHATAN CLAY MANUFACTURING COMPANY are supplying their cream-white bricks for the new Hall for the Board of Education, New York City, N. LeBrun & Sons, architects; also for the new theater building being erected at 42d Street and Seventh Avenue, New York City, for the Hammerstein Amusement Company.

THE BRICK, TERRA-COTTA, AND SUPPLY COMPANY, Corning, N. Y., have commenced the erecting of another muffled kiln. This is the third muffled kiln constructed this year by the company, who have also built a large brick kiln, enlarged dryers, and made other necessary improvements to their property.

THE ILLINOIS SUPPLY AND CONSTRUCTION COMPANY report contract to furnish 100,000 gray brick to be used in the new armory building now being erected for Light Battery A, of Missouri, at Grand Avenue and Rutger Street, St. Louis; also contract from Lincoln, Neb., and one at Muncie, Ind., for the same kind of press brick.

THE CANTON SPARTA BRICK COMPANY, Canton, Ohio, have recently added new screens and shape machinery to their plant; built a large storehouse to facilitate shipping brick in winter, and otherwise enlarged and improved their works. The company state that under their present advantages they are making a better brick than ever before.

THE FAWCETT VENTILATED FIRE-PROOF BUILDING COMPANY, LTD., have just completed the structural steel and fire-proofing for boiler house in yard of House of Correction, East Cambridge, Mass., O. W. Cutter, architect; also fire-proofing of Home for Aged People, Mt. Auburn Avenue, Cambridge, Mass., Stickney & Austin, architects.

THE CELADON TERRA-COTTA COMPANY is supplying the roofing tiles for residence, E. T. Affleck, Columbus, Ohio, Yost & Packard, architects; Episcopal Church, Ambler, Pa., M. B. Bean, architect; Memorial Library Annex, Westerly, R. I., Longstaff & Longstaff, architects; residence Geo. Crilly, Chicago, W. C. Zimmerman, architect.

THE EXCELSIOR TERRA-COTTA COMPANY, of New York, have just executed for Mr. Robert Maynicke, architect, the semi-glazed white terra-cotta for a ten-story office building on the northwest corner of Fifth Avenue and 19th Street. This is the only building, with but one exception, in which semi-glaze terra-cotta has been used in New York City, and the material has attracted a great deal of favorable attention.

THE DAGUS CLAY MANUFACTURING COMPANY, Daguscahonda, Pa., report that they are supplying the brick for three Pittsburgh buildings having ornamental fronts. Colors are to be dark flashed, gray and old gold speckled. They are also supplying 50,000 pink brick for P. J. Carlin & Co., Brooklyn; the front brick for the new store building of Reynolds Hardware Company, Reynoldsville, Pa., and for a number of buildings at Philadelphia.

THE BERLIN IRON BRIDGE COMPANY, of East Berlin, Conn., are erecting for the Waterbury Manufacturing Company, Waterbury, Conn., a new blacksmith shop, two stories high. The building is to be of fire-proof construction throughout. The roof has steel trusses supporting the covering of corrugated iron, lined with the Berlin Iron Bridge Company's Patent Anti-Condensation Lining. The building is about 40 ft. square.

AT a special meeting of the board of directors of the Atlantic Terra-Cotta Company, held last month, De Forest Grant was elected president and general manager; W. Harris Roome, vice-president; Richard T. Wainwright, secretary. The company wish announced the fact that they are now making a specialty of extra large pieces of terra-cotta with true alignment; also white terra-cotta without slip, guaranteed not to dissolve.

A NEW factory is being erected at Lowell by the American Mason Safety Tread Company, of Boston, to accommodate its increasing business. The demand for the product of the company is growing by leaps and bounds, as architects throughout the country become acquainted with its merits. It is found particularly applicable



SEAL OF THE NEW YORK ZOOLOGICAL SOCIETY BIRD HOUSE, BRONX PARK, NEW YORK CITY.
Executed in Terra-Cotta by the Atlantic Terra-Cotta Company.
Heins & La Farge, Architects.



COMPETITION DESIGN FOR THE METHODIST CHURCH AT SOUTHPORT, CONN.
Hobart A. Walker, Architect.

to schoolhouse stairs, whether of wood or iron, and its use has been specified in a great many of these buildings in various cities. Work on the equipment of the great South Terminal Station, Boston, has just been completed.

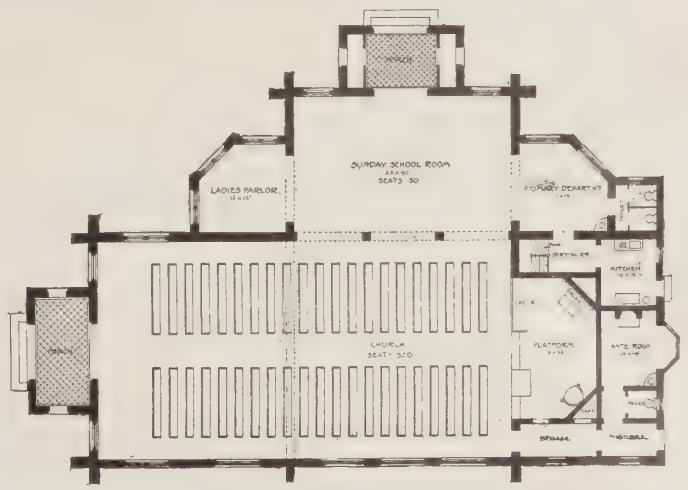
THE OHIO MINING AND MANUFACTURING COMPANY, through their Pittsburgh agents, Burgy & McNeill, have closed a contract with the board of school control to furnish 200,000 face brick for the new building to be erected in twenty-second ward, Pittsburgh, Pa.; E. J. Carlisle & Co., architects; building will cost $175,000. Messrs. Burgy & McNeill are furnishing 150,000 buff brick for new courthouse and jail, Washington, Pa.; also the Norman gray brick for W. A. Zahn residence, Crafton, Pa., and 100,000 buff brick for Crafton M. E. Church.

THE MOSAIC TILE COMPANY, Zanesville, Ohio, report the following orders: tiles for the floors and walls of the new convent building of the Sisters of St. Francis, at Oldenburg, Ind., in which will be used about 28,000 sq. ft. of their Ceramic Roman Mosaic Tile; 15,000 sq. ft. of Ceramic Roman Mosaic Tile in the floor space of Montgomery Bros.' jewelry store at Los Angeles, Cal.; 30,000 sq. ft. Ceramic Florentine Mosaic Tile, 6 by 6 in. plate with inset designs, for the floors of the C. H. Allen & Co. building, at Fort Wayne, Ind., B. S. Tolan, architect.

THE ATLANTIC TERRA-COTTA COMPANY are supplying the architectural terra-cotta for the following buildings: Bird House and Reptile House for the New York Zoological Society, Heins & La Farge, architects; apartment house, 129th Street and Third Avenue, New York City, Kurtzer & Rohl, architects; Home for Indians, Buffalo, N. Y., Barney & Chapman, architects; apartment house, 65th Street, New York City, J. E. Ware & Son, architects; apartment house, 123 E. 16th Street, New York City, Alex. O. Finkle, architect.

AT the annual meeting recently held by the stockholders of the Burlington Architectural Terra-Cotta Company, T. Arlington Macan was appointed general manager. This is a radical change, by which the responsibility of conducting the entire plant is placed under new control. Mr. Macan has an extended reputation in the terra-cotta industry, as being thoroughly conversant with all the details of manufacture, and being fully competent to successfully conduct any business in this line put under his supervision. The company report the general condition of their business as being most promising, their past season having been very successful.

THE recently constructed subway under Avon Street (Boston), connecting the main store of Jordan, Marsh & Co. with their new building, contains a very handsome lining of enameled brick tile furnished by The Grueby Faience Company. The side walls of the whole interior are finished in this material, from the coping of the ceiling arch to the floor, some six feet. The color treatment is most effective, consisting of cream-white tiles between an 8 in. base of green slate and a frieze and cornice of dull green enamel. The company wish



PLAN, COMPETITION FOR THE METHODIST CHURCH AT SOUTHPORT, CONN.

announced that Mr. Philip McKim Garrison, Mohawk Building, 160 Fifth Avenue, New York, N. Y., has been appointed New York agent to handle their product in enameled and faience building materials.

CHAMBERS BROS. COMPANY, Philadelphia, Pa., report that they have the present month either made shipment or received orders to ship the following machines: one of their largest size automatic end-cut brickmaking machines shipped to Virginia; one large size automatic side-cut brick machine, with other fixtures,



HOUSES, BROOKLINE, MASS.
Shepley, Rutan & Coolidge, Architects.

to Louisiana; an intermediate size automatic side-cut machine to Georgia; and an automatic end-cut machine to Alabama; besides these, they have other work in preparation on orders calling for shipment after January 1. The company call attention to the fact that the machine sent to Louisiana is to be erected in a yard adjoining that on which was placed, about a year ago, their first No. 1 Automatic Side-Cut Machine, — a good evidence that the first machine has given thorough satisfaction.



RESIDENCE AT BUFFALO, N. Y.
McKim, Mead & White, Architects.

We were much interested to learn recently of what we believe is the first instance of a firm of American manufacturers of burnt clay fire-proofing being awarded contracts to supply their product to building operations in foreign countries. This has been done in the following instances by The Pittsburgh Terra-Cotta Lumber Company, Pittsburgh, Pa. The contract for fire-proofing a building for The Tramway Power Company, Dublin, Ireland, was awarded to them several months ago. This material, amounting to about 1,500 tons, was shipped from their works at East Palestine, Ohio. They also sent men to Dublin to set the material, and have since been advised that everything in connection with the work was satisfactory, and the parties exceedingly well pleased. Another contract amounting to about 1,000 tons for a municipal building has been awarded them from Mexico City, Mexico. The construction on this has not yet been started, but the tile, which was made at their works at Port Murray, N. J., is now *en route*. Men to set this material will be sent by the company.

We have received the following communication from Messrs. Randolph & Clowes: —

Waterbury, Conn.,
Dec. 3, 1898.

Because of the excessive storm in this locality, the roof of our brass and copper rolling mill caved in on Sunday morning, November 27, on account of which we have been somewhat delayed in filling orders for this class of material during the past week.

The entire brass and copper mill will be in full operation December 12. No damage or interruption occurred in any other department of the works, and the seamless tube, brazed tube, kettle boiler plants were in full operation Monday morning, November 28, as usual. The damage to the machinery was very small, less than $1,000, and the cost of replacing the roof with a permanent and substantial wooden roof will not exceed $6,000, or if an iron roof is used will not exceed $12,000, which expenditure will put the mill in better condition than before the accident.

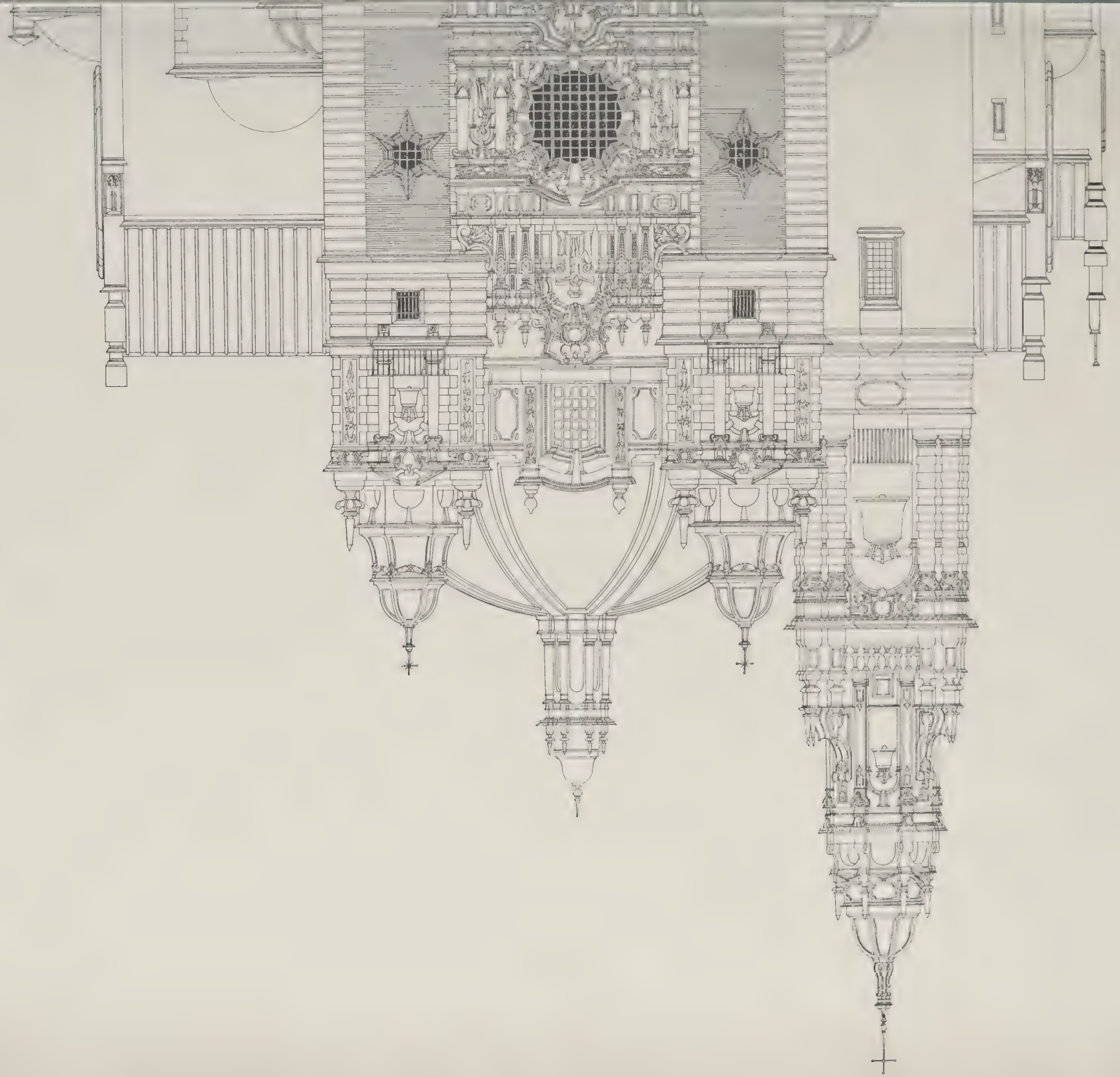
The Boston & Maine Railroad Company are erecting at Portsmouth, N. H., a building for their Electric Power Station. The building is 118 ft. wide and 64 ft. long, divided into two rooms: one for the boilers, and the other for the engines and electric generators. The side walls are of brick, the roof construction fire-proof; the trusses are of steel, and they support steel beams for the purlins, on which is to be placed a concrete roof. The contract for the steel work was given to the Berlin Iron Bridge Company.

For the past month the Grueby Faience Company have been holding an exhibition sale of their products in pottery at the Westminster Chambers, Boylston Street, Boston. From an artistic and also a commercial standpoint, this exhibition has been deservedly successful, attracting much interest among those appreciative of fine ware. The Grueby pottery has an individuality that gives it a distinctive position in this art, both in its glazes, which vary from the rich and brilliant in character to those with soft, dull blooms, and in its beauty of design, wherein every line is indicative of natural forms of floral life. We have in our pages recently described at some length the remarkable qualities of this ware, so will not now touch further on the matter, except to say that their latest efforts have been productive of even finer results than had been achieved at date of our article.



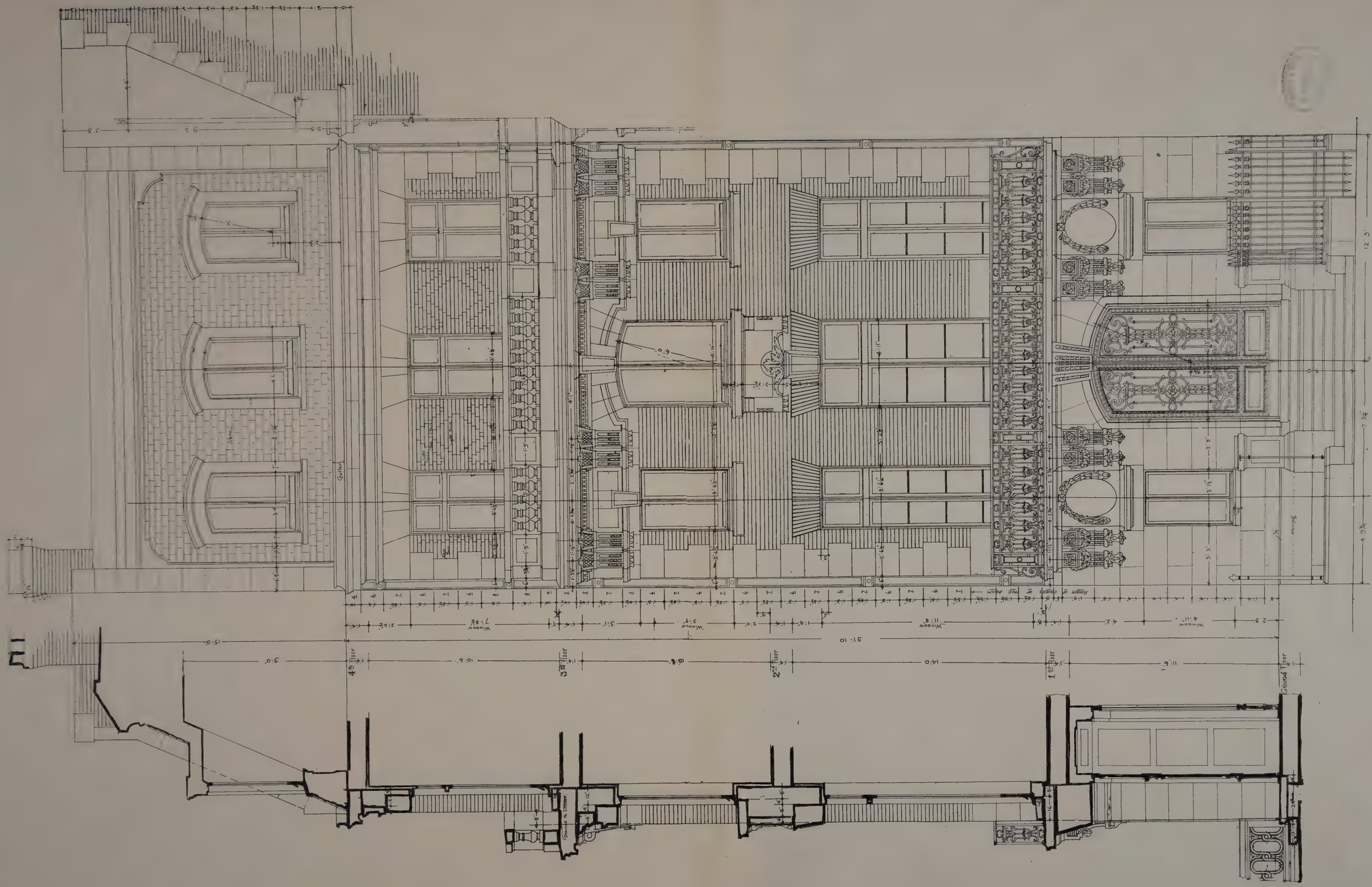
HAVEMEYER STABLE, NEW YORK CITY.
Thayer & Wallace, Architects.

The American Enameled Brick and Tile Company have recently furnished, through their Boston agent, John W. Hahn, the enameled brick used in the Rhode Island Hospital, at Providence, Stone, Carpenter & Wilson, architects; also the enameled brick used in a new primary school at South Boston, William H. Besarick, architect.



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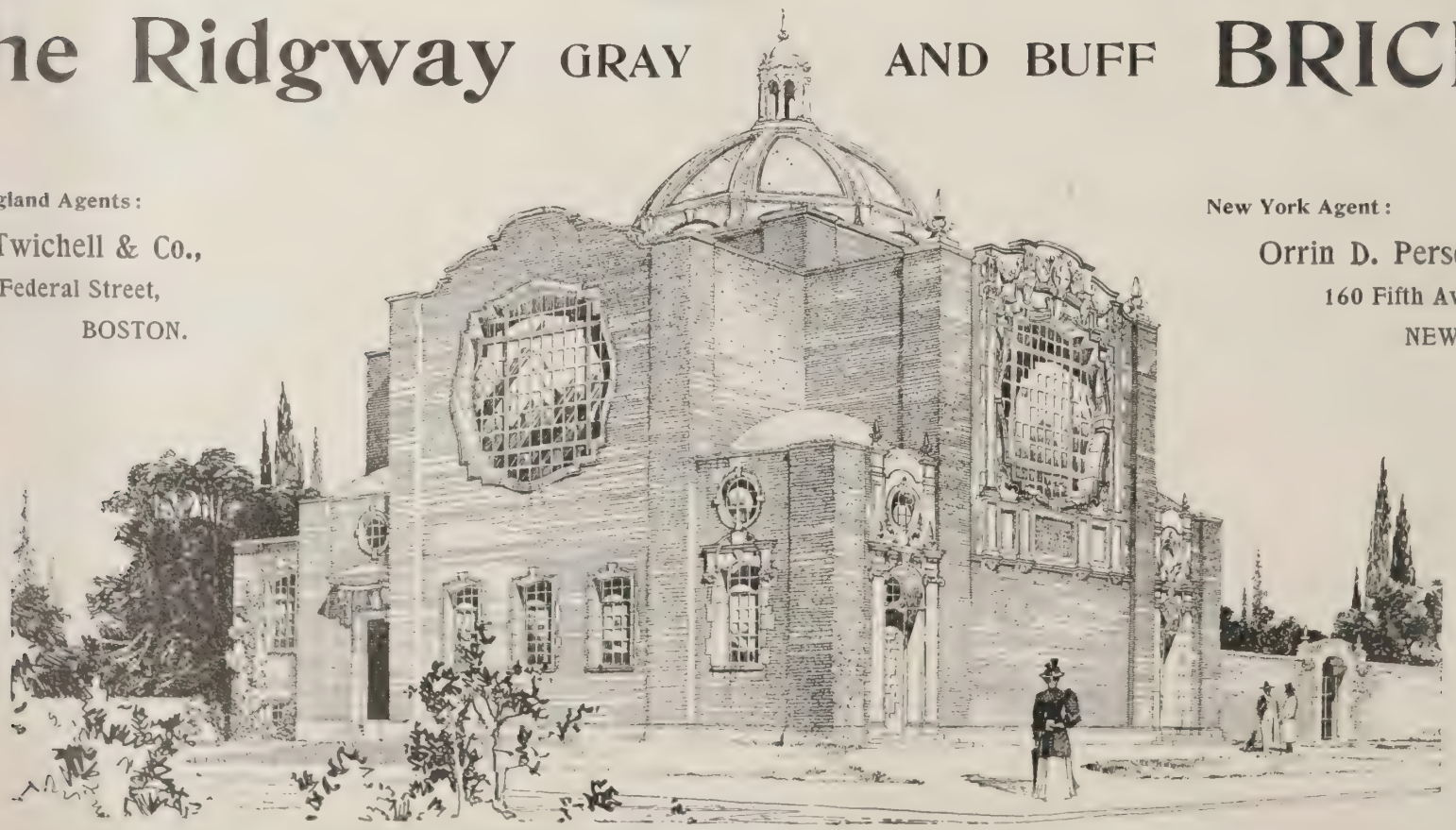
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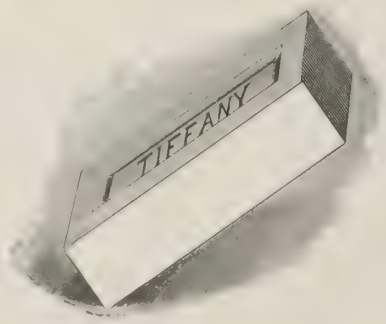
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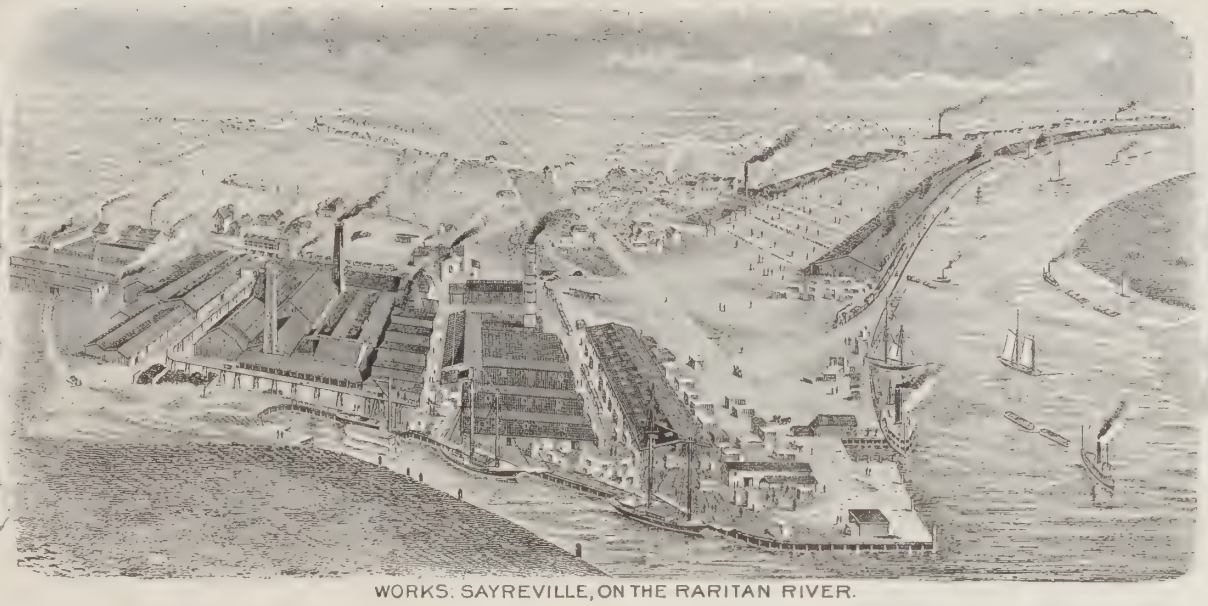
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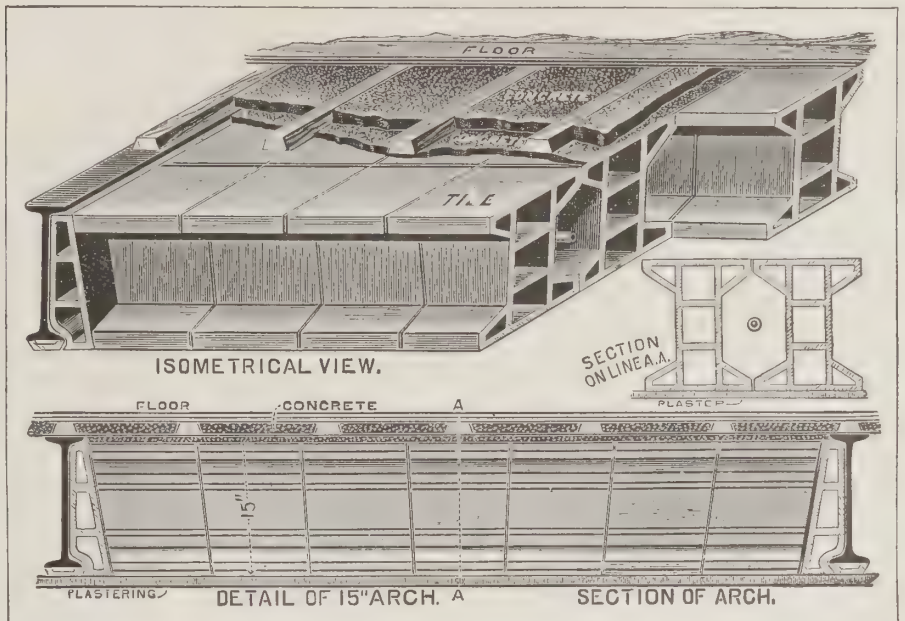
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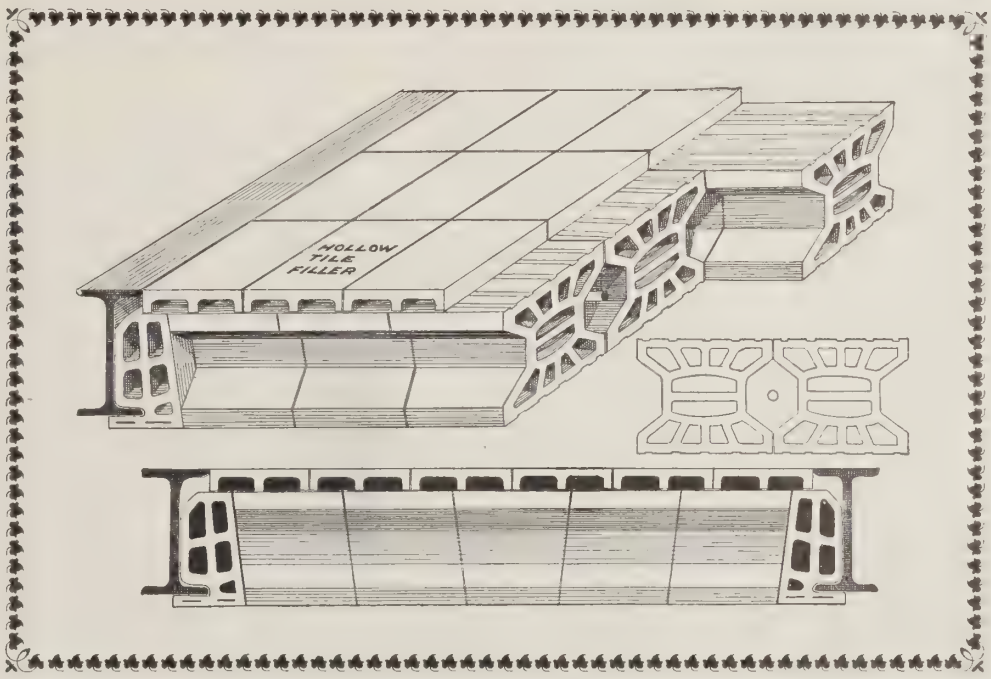
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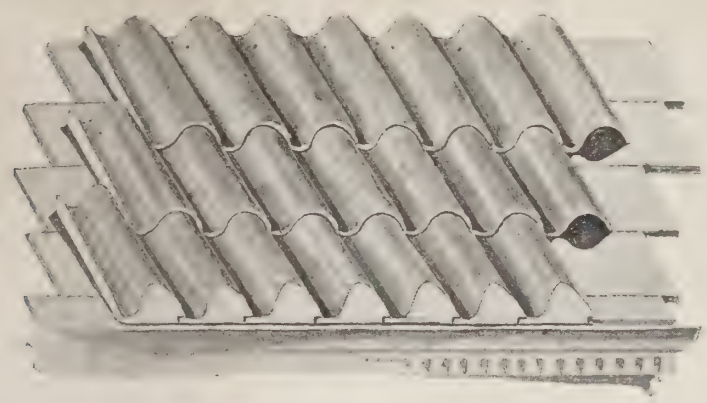
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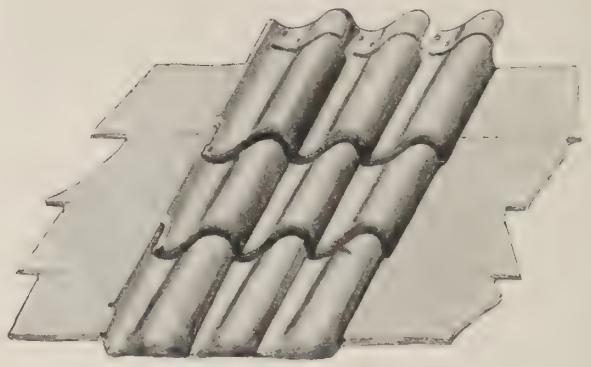
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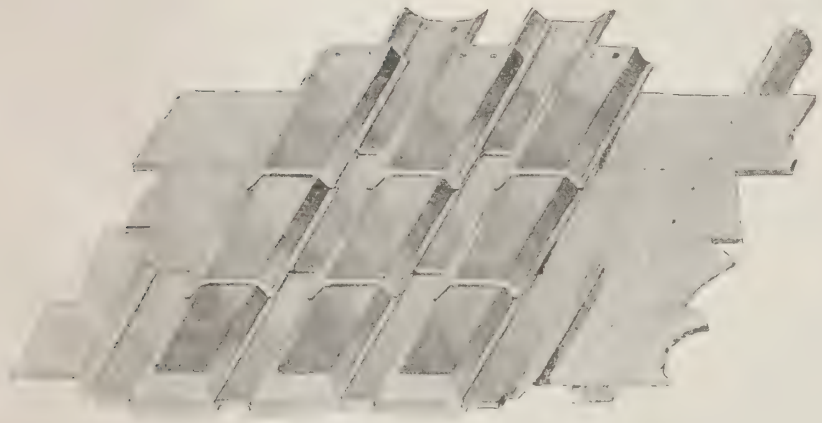


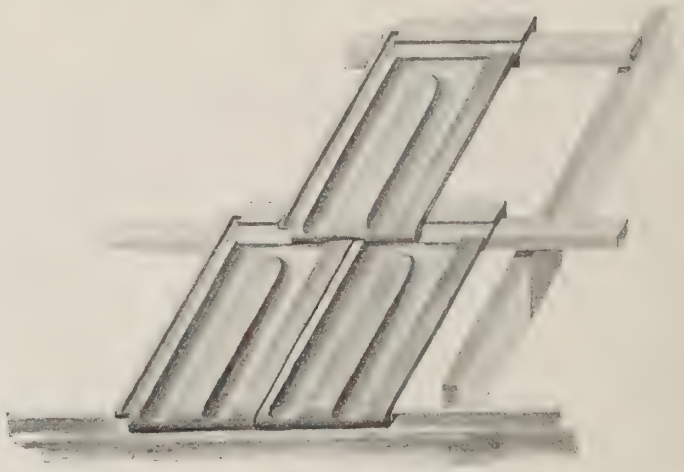
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Fig. 5.

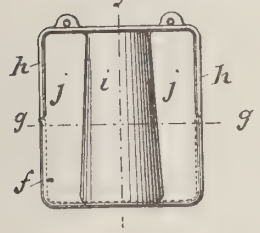


Fig. 2.

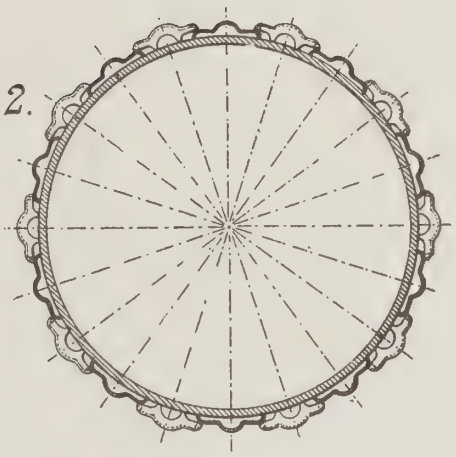


Fig. 4.

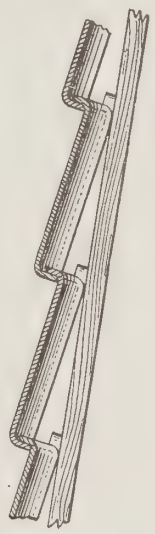


Fig. 6.

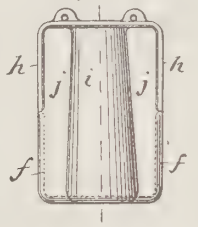


Fig. 1.

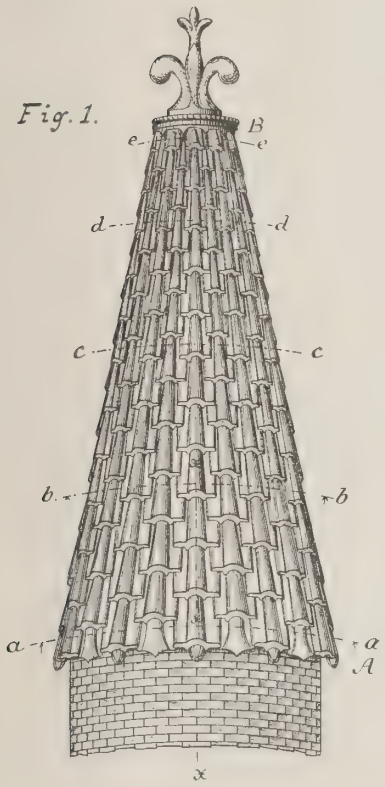


Fig. 3.

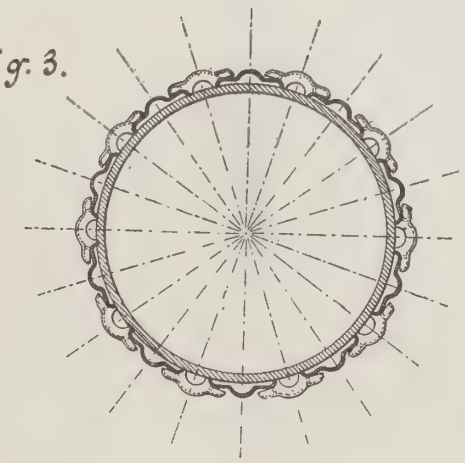


Fig. 7.

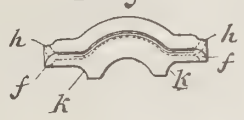




Fig. 8.

THE purpose of this invention is to reduce to the minimum the number of different sizes of tiles required to cover a conical roof, and consists of a series of interlocking tiles, wherein the units or members are laterally adjustable upon one another, to embrace different circumferences in the conical roof, while preserving the number of tiles included in a circle and preserving their individual lateral dimension for a considerable number of tiers in the order of laying.

The feature of lateral adjustability is adapted to preserve perfect uniformity of convergence in the said lines of relief. Owing to the small number of different sized patterns required, economy is effected in molding and laying the tiles by reason of uniformity and infrequent change of selection.

Heretofore it has been necessary, in order to preserve the converging alignment of the tiles upon a conical roof, to manufacture especially therefor as many different patterns of tile as there are tiers in the entire covering.

The herein-described invention is so adapted that whether the circular series composed of a given number of tiles have a maximum or a minimum circumference, the weather joints will be maintained.

It will be obvious that what is herein stated with reference to tiling for conical roofs is applicable also to roofs having the form of conical segments.

Referring to the accompanying drawings, in which similar characters of reference indicate corresponding parts in each view: Fig. 1 is a perspective elevation showing a tiled roof constructed according to this invention; Fig. 2, a horizontal section at *a*, *a*, Fig. 1; Fig. 3, a horizontal section at *b*, *b*, Fig. 1. Fig. 4 represents a vertical section enlarged, taken at *x*—*x*, Fig. 1; Fig. 5, a face view of a single tile of one dimension of pattern; Fig. 6, a face view of a single tile of another dimension of pattern; Fig. 7, a bottom end view of Fig. 5. Fig 8 represents these tile as actually laid on a certain tower, and shows the uniformity of lines of convergence and perfect alignment. It also discloses our series of ornamental eave tile.



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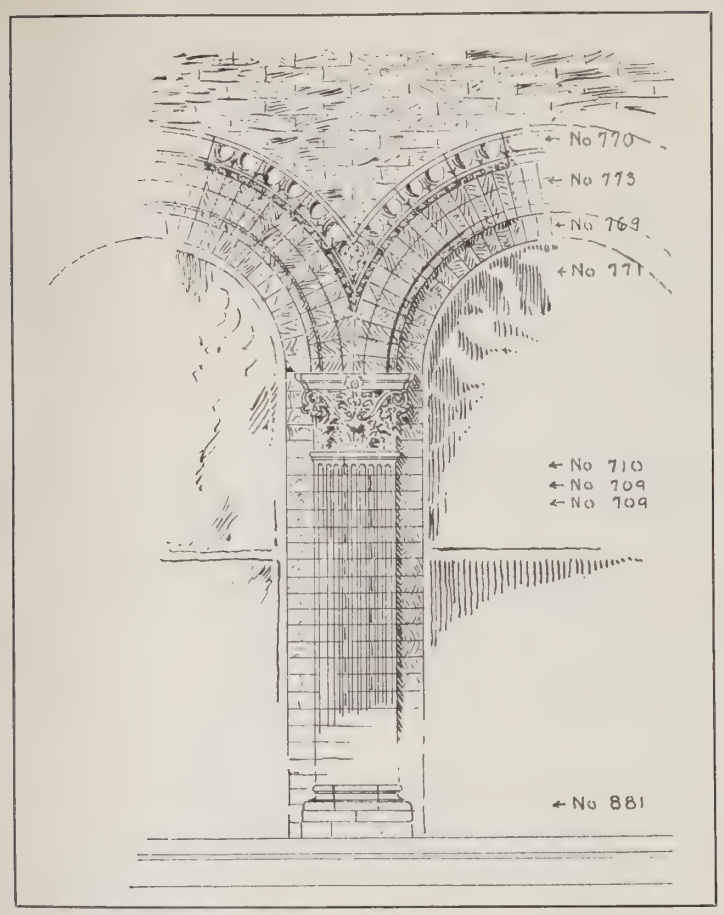


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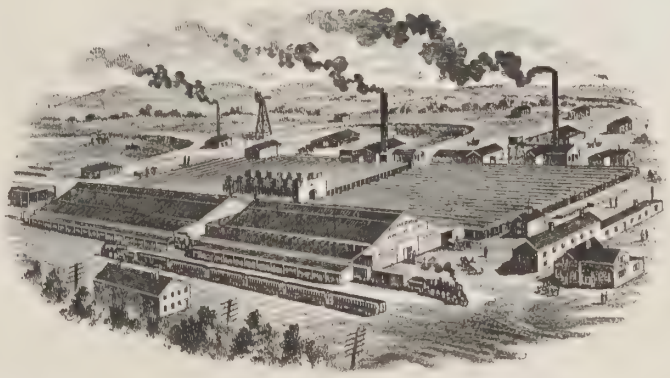
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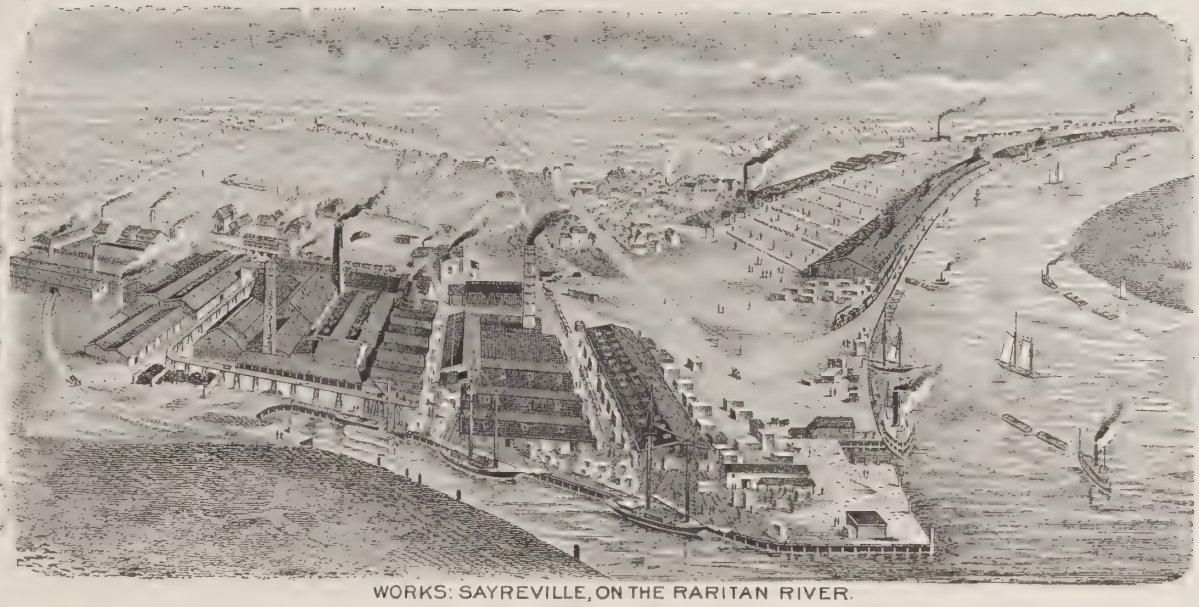
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Trolley Power House, Woodside, L. I. John D. Woodruff, builder.
Private Stable, Portchester, N. Y. Arch., Nathan C. Mellen. Wm. Ryan, builder.
Fire Engine House, Newark, N. J. James Moran, builder.
In addition to these there are other large contracts and an innumerable amount of smaller ones.
New York Athletic Club House, New York City.
Columbia College Gymnasium and University Hall, New York City. McKim, Mead & White, Architects. Norcross Bros., Builders.

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W. G. WEAVER,
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Newark, N. J.

LEWIS LIPPITT & CO.,
Builders' Exchange,
Washington, D. C.

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JOHN W. HAHN,
166 Devonshire St.,
Boston, Mass.

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14 East 23d Street,
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Ludowici Roofing Tile Co.

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High Grade Vitrified Paving Brick.

Brush & Schmidt,

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The Farnley English Glazed Bricks, Imported in all colors.

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Enameled Brick. Ornamental Terra-Cotta.

Roofing Tiles. Metal Lath.

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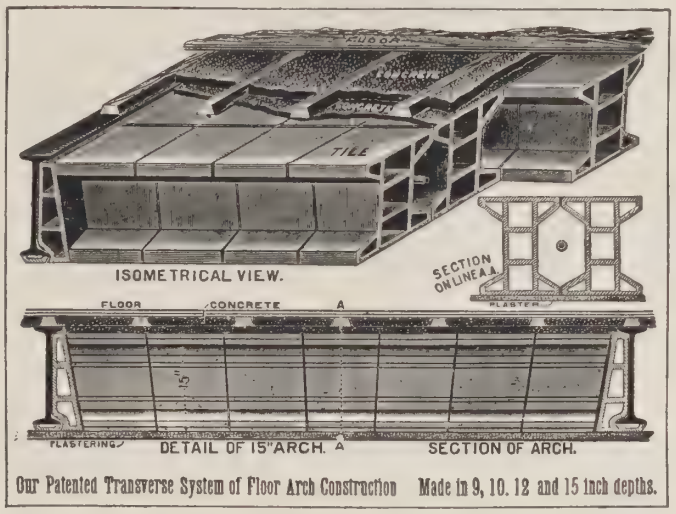
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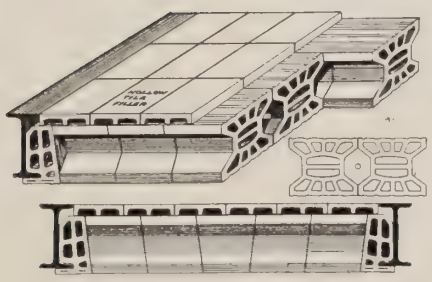
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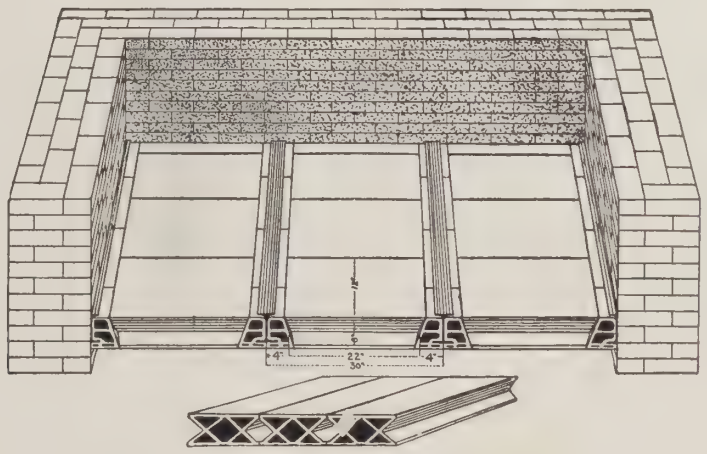


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DEPTH OF ARCH, 6 ins.
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Porous Terra-Cotta of all Sizes,

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These are displacing the ordinary wooden racks, and meeting with general favor. Being both rat and vermin proof, all danger from falling racks and the consequent destruction of choice wines is avoided.

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To meet a growing demand for a light, simple, yet strong and inexpensive fire-proof construction for floors, we beg to offer our "Eureka" arch (see cut above), for which we claim the following advantages:—

Absolutely fire-proof — made of *fire-clay*.
Quickly erected — no centering required.
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Light in weight — no *concrete* necessary.
Light iron construction only required.
Ironwork thoroughly protected.
Only three sections forming arch.
Can be put up during any season of the year.

It is absolutely necessary, when using this arch, that the iron beams be spaced 30 ins. center, to insure a perfect and well-constructed arch.

This arch is composed of three tiles: two abutments, or "skew-backs," which fit the beams (thoroughly protecting their lower flanges), and one center or "key tile," set between 5 in. or 6 in. deep beams. The tie-rods going between openings on side of brick and allowing for same, the cutting of tiles becomes unnecessary.

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Patents in England, Belgium, France, United States.

Contractors for Structural Steel, Fireproof Floors, Partitions, etc.

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SOMERSET APARTMENT HOTEL, BACK BAY FENS, BOSTON, COVERED WITH 10″ CONOSERA TILE.

ARTHUR H. BOWDITCH, *Architect.*

ARTHUR H. BOWDITCH,

Architect,

112 WATER STREET, - - - BOSTON.

Dec. 1, 1898.

CHARLES T. HARRIS, Pres. Celadon Terra-Cotta Co., Ltd., Alfred, N. Y.

My dear Sir : — Your letter referring to the tile roof on the "Somerset" reached me duly, and so far as the work itself goes, I can only say that it is worthy of, and has received, the most unqualified praise, not only from ourselves and the owners, but also from the public at large.

The color and quality of the tile and the workmanship of the entire job have filled our highest expectations, and I am sure the tile will prove itself in the future all that you have claimed for it as a roofing material.

Please accept for yourself, and extend to Mr. Clarke, our sincere thanks for your and his courtesy and the cooperation we have received in every way from your company in carrying out not only the letter but the spirit of your contract.

Very truly yours,

ARTHUR H. BOWDITCH.

NEW YORK OFFICE,
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NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY,

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The Brickbuilder
for 1899 ... Prospectus

PLATE FORM OF SCALE DRAWINGS.

IN this department there will be reproduced each month, carefully selected scale drawings of the very best work being done in this country, wherein brick or terra cotta is employed. These illustrations will comprise elevations, plans, and details secured by personal solicitation from the best offices.

DRAWINGS AND PHOTOGRAPHS OF ENGLISH WORK.

We are assured by our representative now at London that we shall be privileged to publish during the year, drawings of some of the best current work of English architects. Arrangements having been perfected whereby our illustrating plates will be made at London, thus avoiding the necessity of sending drawings to this country, we feel reasonably certain of adding this desirable feature to our Plate Form. In addition to these drawings we shall illustrate from photographs recently secured, a number of English brick cottages, manor houses, college buildings, etc.

MEASURED DRAWINGS OF OLD FOREIGN WORK.

There will be published during the year, measured drawings of old foreign work, made especially for us by men holding travelling scholarships. These drawings consist chiefly of details of entrances, windows, cornices, string courses, etc.

CONTRIBUTORS TO LETTER PRESS.

Among those who will contribute to our columns during the year on architectural subjects are:—

Clarence H. Blackall,	F. W. Fitzpatrick,	William T. Partridge,
James Brite,	Elmer E. Garnsey,	Allen B. Pond,
Arthur G. Everett,	R. W. Gibson,	T. Henry Randall,
Ernest Coxhead,	Bertram G. Goodhue,	Julius A. Schweinfurth,
Ralph Adams Cram,	Julius F. Harder,	Russell Sturgis,
Thomas Cusack,	Thomas M. Kellogg,	R. Clipston Sturgis,
Frank Miles Day,	F. E. Kidder,	Edmund M. Wheelwright,
John Lyman Faxon,	Henry P. Kirby,	Peter B. Wight.
	W. A. Otis,	

Engineering subjects relating to architecture will be discussed by

Charles J. Everett, Jr.,
Frank S. Harrison,
Henry W. Hodge,
Corydon T. Purdy,
and Others.

Leading Articles for the Year.

COUNTRY CHURCH TO COST $50,000.

Following the plan inaugurated last year, of inviting a number of well known architects to contribute—each an article which shall be a treatment of some one building of the popular class, according to a program giving certain requirements, we have chosen for this year, two types; first,

A COUNTRY CHURCH TO BE BUILT OF BRICK AND TERRA COTTA.
Cost, $50,000.

The contributors will be

Ernest Coxhead	(Coxhead & Coxhead)	San Francisco.
Ralph Adams Cram	(Cram, Goodhue and Ferguson)	Boston.
Allen B. Pond	(Pond & Pond)	Chicago.
T. Henry Randall		New York.
R. Clipston Sturgis		Boston.

PUBLIC LIBRARY TO COST $100,000.

Second,

A PUBLIC LIBRARY TO BE BUILT OF BRICK AND TERRA COTTA.
Cost, $100,000.

The contributors will be

James Brite	(Brite & Bacon)	New York.
Arthur G. Everett	(Cabot, Everett & Mead)	Boston.
Julius F. Harder	(Israels & Harder)	New York.
Thomas M. Kellogg	(Rankin & Kellogg)	Philadelphia.
Julius A. Schweinfurth		Boston.

These articles will be illustrated from drawings and sketches of elevations, plans and details.

THE USE OF BURNT CLAY PRODUCTS FOR INTERIORS.

By Russell Sturgis. In two illustrated articles, Mr. Sturgis will show the possibilities of burnt clay as a medium for artistic interior work.

MONTEVENTOSO.

By Bertram Grosvenor Goodhue. Mr. Goodhue has been fortunate enough to unearth an hitherto unknown town on the northern slope of the Appenines, where he found some of the most notable brick and terra cotta architecture of North Italy. A description of this town, with sketches of its architecture, will be given in two numbers of next year.

Other Leading Articles for the Year.

PICTURESQUE BUILDING SITES.

By Henry P. Kirby. There will be two articles upon the subject, which will be illustrated from charming pen and ink sketches which Mr. Kirby has specially prepared for this series.

THE MINOR BRICK BUILDINGS OF FRANCE.

By William T. Partridge. There will be three articles in this series, which will be illustrated from Mr. Partridge's own collection of photographs and sketches of interesting small brick buildings, which are located in the smaller cities and towns of France.

THE ARTISTIC TREATMENT AND USE OF ROOFING TILE.

By W. A. Otis. In two articles upon this subject, Mr. Otis will illustrate some of the many artistic effects that may be obtained with roofing tile, and describe the best methods to be employed in laying them.

AMERICAN TILE WORK.

By Clarence H. Blackall. A summary of what has been accomplished in this line, and a description of the most notable work produced by our American manufacturers. This will be considered carefully from the artistic point of view as showing the possibilities of this art industry.

THE FORMAL GARDEN.

By Elmer E. Garnsey. In connection with this series, consisting of two articles, Mr. Garnsey will describe and illustrate some of the more interesting examples of foreign gardens, suggesting the possibilities in architectual effects that may be obtained at a reasonable cost by the use of terra cotta.

ARCHITECTURAL TERRA COTTA.

By Thomas Cusack. The valuable series of papers which have been contributed by Mr. Cusack under this general heading will be continued during the coming year. He will advocate a more general use of terra cotta and brick in the church architecture of the future and discuss the somewhat neglected subject of color combinations in plain and enamelled surface treatment; not only on exteriors, but in the vestibules, corridors, etc., of public buildings. Historical data will be cited, and in each case selected examples will be fully illustrated by drawings and photographs taken from successful work of recent execution.

ENGINEERING PROBLEMS RELATING TO ARCHITECTURE.

A series of papers which will deal with the every day problems of construction. Names of contributors announced elsewhere in this prospectus.

FIRE-PROOFING.

In this department, which is set apart especially for the discussion of up-to-date matters pertaining to fire-proof construction with burnt clay, there will be published a most valuable series of papers, descriptive of improvements that have been recently made in the construction of arches, partitions, etc. In addition to these, other papers will be contributed by leading authorities on fire-proof construction.

MORTARS AND CONCRETES.

This department is maintained for the purpose of furnishing that class of material which shall be an aid to architects and builders who recognize the necessity of care in successfully employing cements, and to that end a series of carefully prepared papers will be published during the year.

MASON CONTRACTOR.

In this department there will be published a series of papers which shall be alike of interest to architects and contractors.

Suggestions from our subscribers as to important questions needing practical discussion are solicited, and all such will be given due consideration.

BRICK AND TERRA-COTTA WORK IN AMERICAN AND FOREIGN CITIES.

The scope of this department will be somewhat enlarged upon during the coming year, and in addition to regular letters from the larger American cities with accompanying illustrations of current work, we shall publish two letters specially prepared for our columns by F. W. Fitzpatrick, on the Interesting Brickwork of Washington, D. C. These letters will be fully illustrated from photographs and sketches. An additional feature will be a contribution by William T. Partridge, on the Modern Brick Architecture of Paris. This, too, will be illustrated from photographs and sketches, which are to be prepared by Mr. Partridge during his forthcoming trip to France. Other interesting foreign brickwork, both old and new, will be shown in this department.

EDITORIAL AND CURRENT TOPICS.

Our editorials are contributed by a staff of able writers, and by them current topics of interest will be discussed.

CONTINUED FROM 1898.

Of the articles promised for, and serials begun during 1898, there remain to be published at least three more papers of Mr. Wheelwright's series on The American Schoolhouse, and Mr. Day's paper on Italian Brickwork. These will certainly appear in the early numbers of the year.

The reprint of Street's Brick and Marble in the Middle Ages will be continued as opportunity permits.

The Brickbuilder is published monthly at Boston, Mass.

By ROGERS & MANSON.

Subscription Price,
$2.50 per year.

Publication Office, 85 Water Street.

CURRENT ITEMS OF INTEREST.

We are in receipt of a very interesting treatise issued by Merchant & Co., Philadelphia, entitled, "How Roofing Tin, Good and Bad, is Made." The facts contained in this little work are, we believe, not known to the architectural profession generally, and are certainly well worth their attention and consideration. The methods of manufacturing roofing plates are briefly outlined, and the two ways by which such plates are coated are described. Particular stress is made of the fact that it is quite impossible to determine by the eye, or any known test, whether or no a plate has been coated by an acid flux or by a palm oil flux, and for this reason the architect should satisfy himself that all plates employed by him in his work are made by reputable concerns, that manufacture goods by that process only which uses the palm oil as a flux. Considerable information is given regarding the system of stamping of sheets as indicating their relative weight, etc., also what to guard against in being misled in this respect by unscrupulous manufacturers. Merchant & Co. will be pleased to mail a copy of this work to any parties interested in same.

In connection with the Convention of the National Brick Manufacturers' Association to be held at Columbus, Ohio, February 7–10, the Baltimore & Ohio Railroad Company announce that they will take pleasure in reserving a special car for the exclusive use of the members from New England and New York going via their system. A similar courtesy was extended by this company last year when the convention was at Pittsburgh, and proved most agreeable to the members from this section. The fare for the round trip will doubtless be based, as heretofore, on the rate of a full fare one way and one third. Privileges of stop-over at Pittsburgh and Washington will be included. In order that the railroad company may know how many to provide accommodations for, they request members in New England and New York that are likely to go via the Baltimore & Ohio System, to communicate before February 1 with Mr. A. J. Simmons, New England Agent, Baltimore & Ohio Railway, 211 Washington Street, Boston.

O. W. Peterson & Co.,

New England Agents

For

Standard Terra-Cotta Company,

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A full line of Plastic Mud and Semi-Dry Press Brick in all Shades, Shapes, and Sizes.

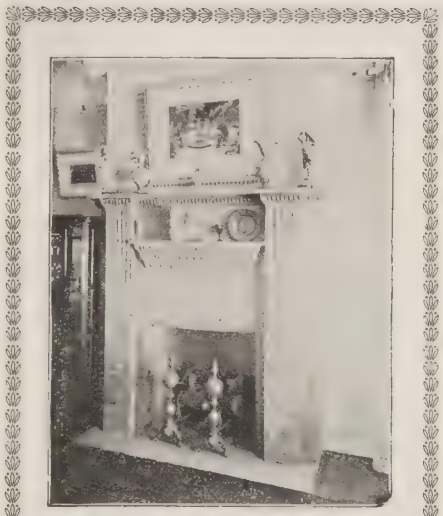
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JOHN HANCOCK BUILDING,

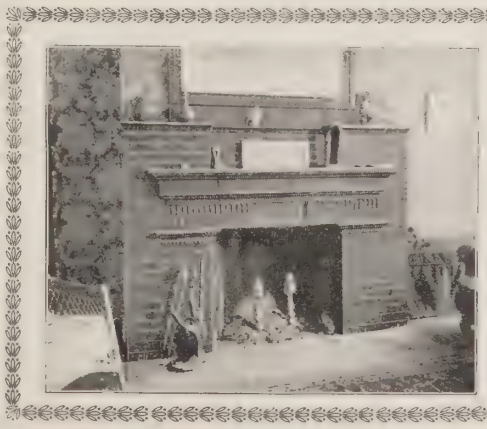
178 Devonshire St., Boston, Mass.

TELEPHONE 484.









Artistic Designs.

There's a most charming and pleasing look about the Fireplace Mantels which we make of Ornamental Brick. They are exceedingly rich, harmonious, and effective. That's why they have met with such immense popular favor.

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Our Sketch Book shows 53 of our own designs, and our detail catalogue will enable you to make designs of your own. Either or both books will be sent you free on request.

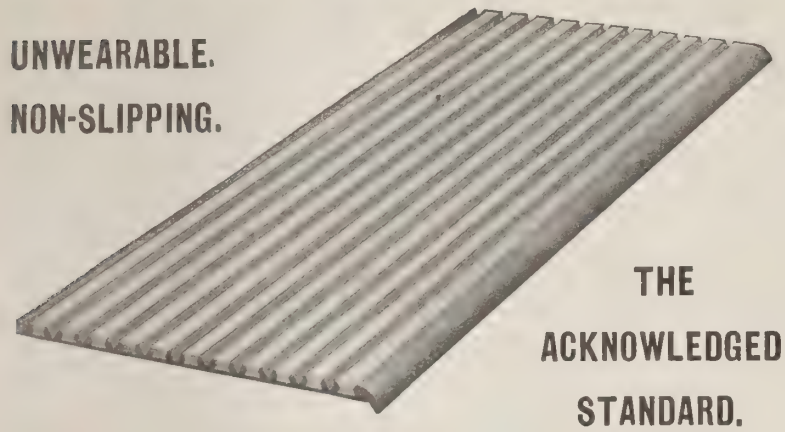
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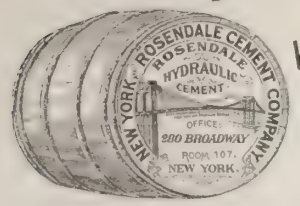
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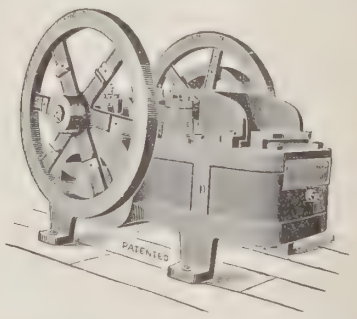
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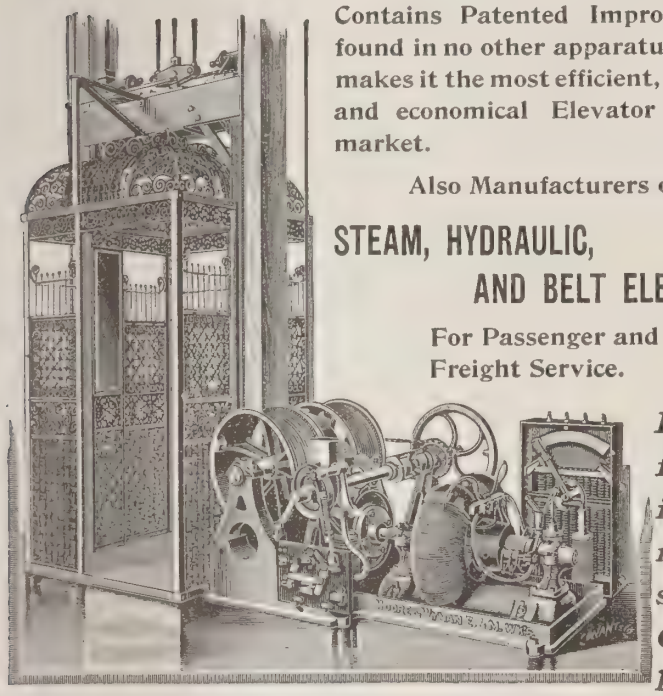


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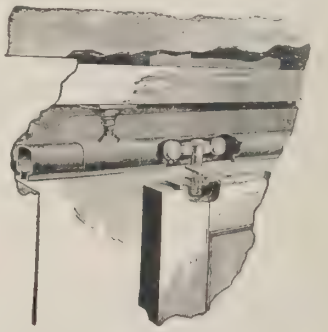
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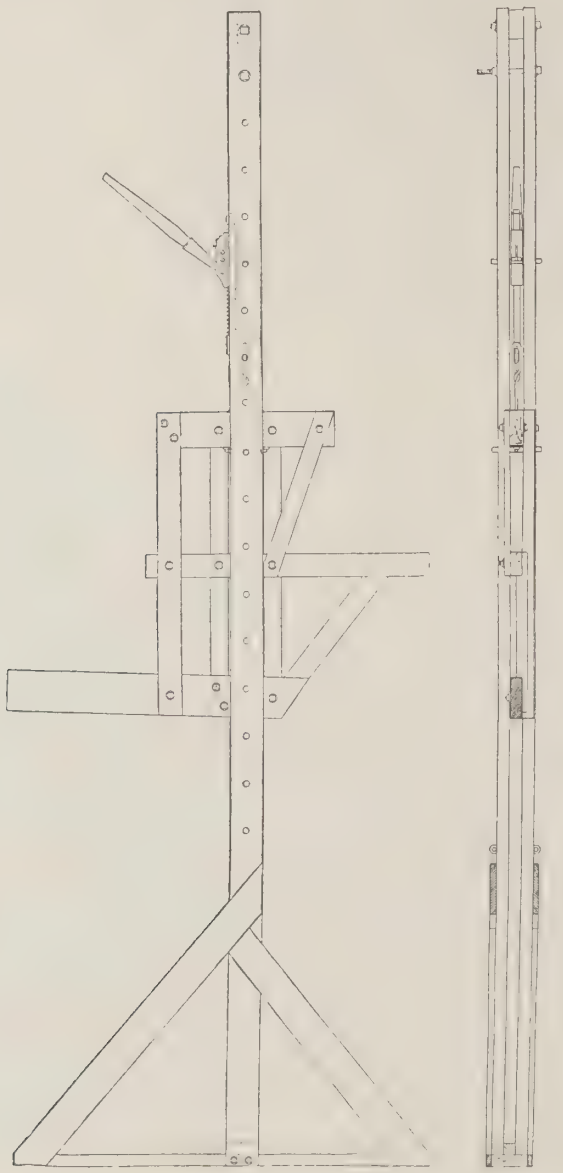
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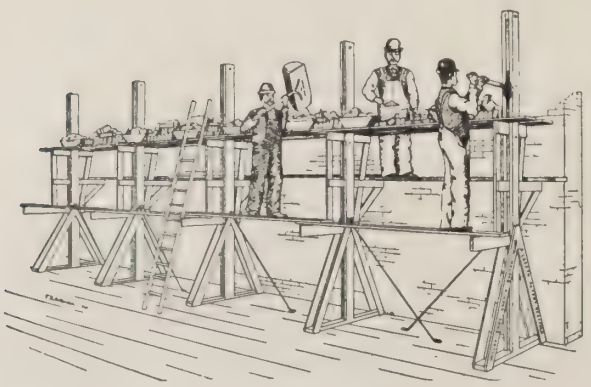
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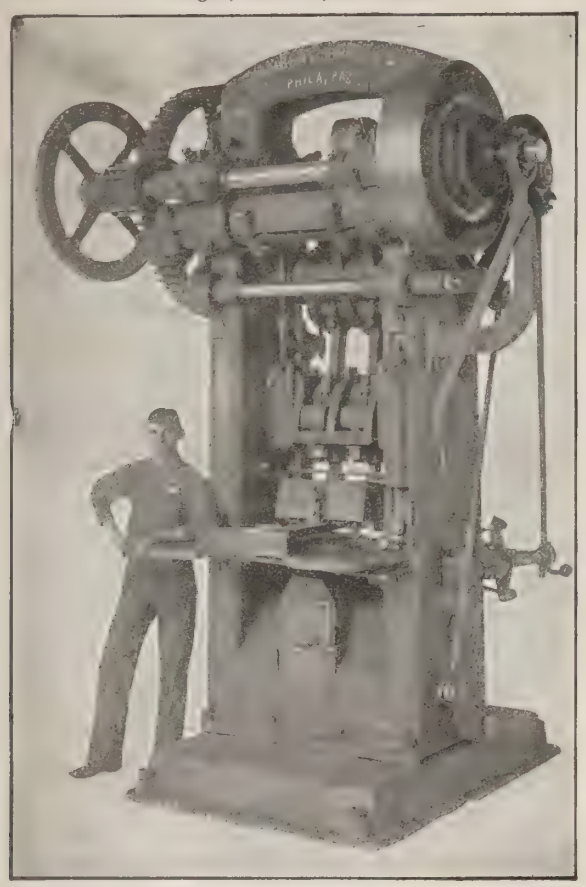
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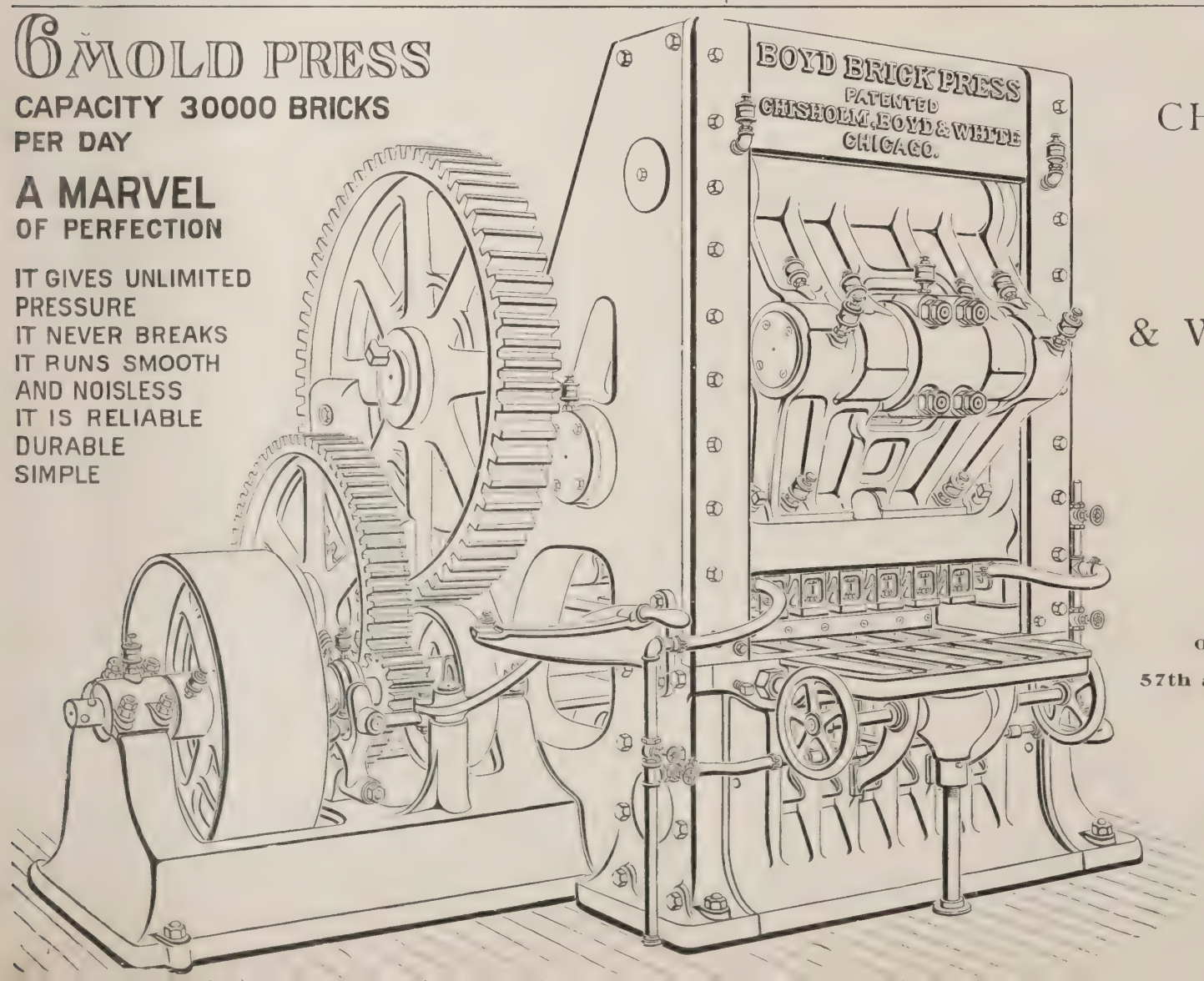
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